THE

AMERICAN NATURALIST.

VOL. XVII.—*OCTOBER*, 1883.—No. 10.

MAN'S PLACE IN NATURE.

BY W. N. LOCKINGTON.

SPECIALIZATION is not in itself any proof of advance, yet both in the domain of mind and that of organic life the term is constantly used as though it carried with it the idea of progress, instead of, as is the fact, a mingling of advance with retrogression, the upward or downward tendency of which can only be determined by a careful comparison of all the factors.

In all evolution, organic or super-organic, specialization commences at the bottom of the scale, and a higher grade is only attained by a longer continuance in a generalized condition before specialization—a continuance during which, not some special part but the entire organism becomes capable of wider activities. As the upward development proceeds, branches break off, become specialized, and perfect or complete themselves, that is, become incapacitated for further development. The real line of advance is not to be sought for in the specialized offshoot, but in the growing stem from which it parted.

To give examples from the Vertebrata; it is not the highly specialized teleostean fish, such as the perch, that is in the line of advance, but the more generalized ganoids and Dipnoi through which the upward line runs on into the Batrachia; neither is it the highly specialized flying pterodactyl that is in the line of advance from reptile to bird or mammal; nor can the line of mammalian descent be traced through the birds, in which, high though the type is, specialization of some parts, accompanied by atrophy of others, has resulted in organic completeness at a level lower than that which has been reached by the summit of the mammalian stem.

The highest specialization is that based upon perfection of the

greatest number of parts, not upon the great development of one part at the expense of others.

In so far as the cow, pig or horse have lost digits, they have degenerated; in so far as the remaining digits are more perfect than those of the primitive ungulates, they have advanced. As a whole they have departed from the main stem of mammalian growth to become adapted to the requirements of one line of life; by the completeness of their specialization they have sacrificed all adaptability to other lines of life, and must therefore be pronounced to be, by their very specialization, inferior to animals which have retained their five digits, put them to new and varied uses, and developed them all towards perfection. The hand of the gibbon, though but a poor instrument compared with that of man, is incomparably superior to the one-toed limb of the horse, for it can be used to walk, to grasp, to pick up objects that are needed, to bring food to the mouth; while the one toe of the horse, perfect though it is for progress upon hard ground, is for other purposes useless. If this one-toed limb, reached by complete disuse of the other digits, and resulting in incapacity of employment for more than one purpose, is higher than the five-fingered member which we have inherited from our hypothetical simian ancestor, then, by a similar line of argument, is the naturalist who is thoroughly acquainted with the genus Scarabæus, or the forms of Foraminifera, superior to a Cuvier, a Lamarck or a Darwin.

Completion is one thing, advance another. The horse stands near, probably at, the end of its line. Farther reduction of digits would entail the loss of limbs, and advance in the direction of brain is precluded by the want of an instrument sufficiently generalized and mobile to do the brain's bidding. Let those who maintain that man has not the highest type of limb because he has carried to their fullest perfection the normal mammalian complement of five digits, try to write their arguments with the middle finger only.

In the same way the folded teeth of the ungulates, though unquestionably more perfect teeth than the simple tubercular teeth of man, are indicative, not of an advance, not of a widening of the powers of nutrition, but of a narrowing of those powers to a special class of foods—a limitation which of itself precludes advance in other directions.

Strangest of all arguments in proof of man's structural inferiority is that which declares the upright face to be inferior to the projecting snout, only for the reason that in the embryo the face is formed beneath the fore-brain, a position permanently retained in man. "The projecting snout," says Dr. Minot,[1] "is a higher structure than the retreating human face." So be it; the baboon has more of this higher structure than we have, the ant-eater excels the baboon, and the pipe fish and gar fish are ahead of both. Let us bow the knee before our superiors.

The persistence of an embryonal character is not of itself any proof of degradation, and when the lack of the brute snout is correlated with a high development of brain, it becomes evident that the total is a structural advance.

We need not ask morphologists or embryologists whether man is the highest animal. We have the proof of it every hour before our eyes. His powers of mind are the resultant of his structure, and have enabled him to conquer all other beings in the struggle of life. That animal is highest which possesses the widest range of faculties. This man undoubtedly does; no other animal has the power, by voice or pen, to exaggerate or depreciate its own importance; no other animal can use the powers of nature as he; no other can produce works which are proportionately comparable to his; and if, therefore, morphology or embryology contradict the facts of life, then are those sciences unsafe guides, as they certainly are only partial ones.

But it may reasonably be doubted whether either morphology or embryology sustain the position assumed by some enthusiastic students of those branches of biology.

Assertions of man's animal inferiority are but the result of a too violent reaction against the thoroughly untenable but far from obsolete idea that man does not belong to the animal kingdom at all, but is, by virtue of his soul, a being sublimely above all others upon the earth—a being for whose benefit or pleasure the earth itself, and all organic life upon it, were divinely prepared.

Only a part of man's superiority is morphological, for mental or, as styled by Spencer, super-organic evolution does not enter into the domain of morphology. Yet this mental evolution can only be maintained, and could only have been gained, by the aid of the most varied bodily relations with the outer world—rela-

[1] AMERICAN NATURALIST, 1882, p. 511.

tions which are incompatible with any but the highest existing perfection of bodily structure. Undoubtedly there are many points in which man is inferior to some animals which, as a whole, are structurally his inferiors. He cannot fly like a bird or insect, swim like a whale, climb like a monkey, or run like a horse; his scent is inferior to that of many animals; in power of distant vision birds surpass him; in strength and size he is excelled by many mammals, reptiles and fishes; yet no other animal can be adduced which has so wide a range of bodily faculties. He can walk, he can run, he can swim (when he tries), he can climb; his delicately constructed fingers can pick up the smallest object, can shape the finest work, without having yet lost their power of grasping, pulling and pushing; his ears are susceptible of all the fine tones of harmony; his eye can appreciate the nicest gradations of color; his touch and eye combined can realize the myriad contours of form. Can any other animal furnish such a list of powers?

Amid all this superiority as a whole, man exhibits great incompleteness and imperfection in parts, and this, combined with generalization of organs and faculties, render it highly probable that future ages may witness much further evolution, both in the direction of the specialization and fixation of characters in derivative species and in the wider range of powers possessed by the uncrystallized remainder.

Already the term man includes several forms which are as much "species" as those so called by the naturalists, though popular prejudice will not recognize the fact. The Chinese and the Ethiopian are as distinct from the Aryan as are the wolf and jackal from the dog, and within our own nationality differences exist which, as pointed out by Professor Cope,[1] would rank as generic were they not prevented from becoming so by the intermarriage of those which possess them with those who do not.

Man in his present condition possesses a body in which the primitive mammalian type has been carried to great perfection without that corresponding degradation by loss of parts which has fixed so many creatures in an inferior position, yet as the general tendency of organic life is toward specialization in some one direction, it is likely that in the future there will split off from

[1] Genera of Felidæ and Canidæ, p. 27, Proceedings of the Academy of Natural Sciences of Philadelphia, 1879.

the human stem species that have aborted some parts, as for example, some of the digits of the foot, or the hindermost molars. Such species will be nearer completion and less capable of further advance; their mental growth as well as their bodily development will be to some extent arrested by the abortion of the parts. If, on the other hand, a portion of the descendants of existing humanity acquire the power of using their feet to perform one set of delicate offices in obedience to the orders of the brain while the hands perform another set, and of using right or left limbs equally well, a vast increase of mental power will be the concomitant of such an acquisition. In many other directions there are possibilities, the eye may gain a power of adjustment that will convert it into microscope and telescope, the ear become ably to close itself at will as is the eye, the touch become far finer than it is now in those most sensitive.

Certain it is, at any rate, that a wide range of physical capabilities is essential to high mental development. The Houhynhym reads well in Gulliver's Travels, but an animal whose limbs are degraded to a line of levers can never advance mentally. Mind is an animal characteristic, and a classification of animals which leaves it out is a one-sided classification.

——:o:——

THE NATURALIST BRAZILIAN EXPEDITION.

BY HERBERT H. SMITH.

SECOND PAPER.—THE LOWER JACUHY AND SÃO JERONYMO.

(Continued from page 716.)

I WILL now describe the main geological features of the São Jeronymo district, which I studied carefully during several weeks, traversing all parts of it on foot or on horseback. My observations here extended over a space about forty miles long and twenty broad, comprehending the country south of the Jacuhy to the Serra do Herval, between the Arroio da Porteirinha on the west and the Arroio dos Ratos and Arroio da Divisa on the east.

I have stated that the hills generally trend east and west. Traveling southward from the Jacuhy, about forty miles, five main ridges are passed, each of which is successively higher than the preceding. The first, at its highest point, is about 600 feet

above the river, but it is generally much lower. Succeeding this is an irregular swampy valley, two or three miles wide; then another ridge, somewhat higher, descending on the southern side to the Arroio dos Ratos, which here flows nearly east. Beyond the Arroio is another ridge, still higher, crossing which we reach several small streams, branches of the Arroio da Divisa, which cut through this ridge from south to north. The fourth ridge, which immediately follows, is rugged and almost mountainous in its character, and higher than any of the preceding. It is followed by a wide, deep valley, on the southern side of which is the fifth ridge, properly the eastern end of the Serra do Herval, which at this point is probably 2400 feet above the Jacuhy.

All of these ridges are composed of massive red granite, either coarse or fine. It is intersected here and there by quartz veins, varying in thickness from a few inches to many hundred feet. Commonly these veins appear as little ridges on the surface; larger ones form long hills, as may be seen just south of the Arroio dos Ratos, on the road to Dous Passaros. The quartz varies from translucent to white or granular.

Above the granite in some places are layers of gneiss and mica schist. These are well seen in the beds of streams between the third and fourth ridges which I have described, about five miles south of the Arroio dos Ratos. Here the layers are very much twisted and distorted, but the stratification is quite evident. Most of the layers are rich in mica, breaking with a schistose fracture, but some are massive, resembling the gray gneiss of Rio de Janeiro. It is difficult to determine the strike, but this appears to be nearly E. W., corresponding to the trend of the granite ridges; some of the folds are perpendicular or reversed; I did not see them in contact with the granite, but they are apparently uncomformable. Gneiss is also seen south of the fourth ridge, in the bed of a stream; here it is massive, and I saw no signs of mica schist.

Overlying granite and gneiss, but seen only in the hollows between the ridges, are layers of stratified and unaltered rocks, forming the third great system seen here. In the São Jeronymo district these beds appear in three portions or basins; first, between the Rio Jacuhy and the first ridge; second, between the first and second ridges; third, between the fourth and fifth ridges, just north of the Serra do Herval. The strike varies from E. W.

to S. E., N. W., the dip is generally a slight one to the N. or N. E., but sometimes to the S. or S. W. Thus, in general, the strike of these beds also approximates to the trend of the granite ridges.

On the southern flank of the fourth ridge the stratified rocks are seen lying directly over the granite; they consist here of sandstones, with layers of sandy shale, and two beds of coal, the whole dipping S. W. at an angle of about 15°. The side of the granite ridge, between the stratified rock, is inclined to the south at an angle of nearly 20°. The approximate section, in ascending order, is as follows:

A. Granite.

B. 1. Coarse sandstone, 30 meters. This rock varies much in appearance as it has been more or less weathered. Where it lies flat on the hillsides or in the beds of streams, it is reddish or purplish in color, and very hard, breaking with an angular fracture. In cliffs, where it has been long exposed to the weather, it is white, soft and friable, and worn into curious forms resembling statuary. The stratification is irregular, and there are many instances of false bedding. I suppose that the rock was formed on a sea-shore, either in shallow water, exposed to winds and currents, or as blown sand in dunes. Towards the top there are some layers of sandy shale, not well exposed.

2. A layer of sandstone, rich in iron, about two meters. Where this rock has been long exposed to the weather the silicious matter has been partly washed away, leaving the iron oxydes in concentric layers. These form balls varying from twelve to twenty-five centimeters in diameter. By selecting the richest specimens ore may be obtained yielding forty to sixty per cent of metallic iron.

3. Clay conglomerate, two meters. The pebbles are silicious, small and irregularly strewn in layers.

4. Silicious conglomerate, three meters, increasing in fineness towards the top and passing into

5. Coarse reddish sandstone, eight meters.

6. Red micaceous shale, three meters.

7. Whitish shale, five meters. Probably this was originally a dark shale, with much carbonaceous matter, the white color being due to weathering.

8. Coarse sandstone, fifteen meters.

9. Sandy shale, one meter.
10. Impure shaly coal, one meter.
11. Sandy shales, ten meters.
12. Coal resembling No. 10, two-thirds meter.
13. Sandy shales, ten meters.

These are apparently followed by other layers of sandstone and sandy shales to a thickness of forty or fifty meters. It should be stated that the thicknesses given above are merely approximate and, in part, suppositional, the sections being much obscured.

The coal at this place, called Dous Passaros, was mined many years ago by an Englishman named Johnson, this being in fact the first coal mine opened in the province. The coal was carried to Porto Alegre, over fifty miles, in ox-carts or on the backs of mules; owing to this difficulty of transport, and to the poor quality of the product, the mine never paid expenses, and it has long been abandoned. I found the shaft-house in ruins, covered with weeds and vines, the shaft itself being nearly full of water. The coal appeared near by in the bed of a stream.

Economically the most valuable basin of the three which I have mentioned, is the middle one, or that lying between the first and second granite ridges, about thirteen kilometers south of São Jeronymo. The stratified rocks here occupy a long oval space, extending about fifteen kilometers from east to west, the greatest width being five kilometers. The rocks strike nearly E. S. E., the dip being a very slight one to the N. N. E. The section, in the main, agrees with that which I have just described,[1] the position of the sandstone and conglomerate beds, and the layer of iron-ore, being the same. Instead of two layers of coal there is only one, but this is much thicker and the coal is of better quality than that of the Dous Passaros mine.

In 1870 the "Imperial Brazilian Collieries Company" was formed in London, with the object of extracting the coal of this basin; 100,000 pounds sterling of capital was subscribed, and the Brazilian government readily granted permission to explore the São Jeronymo district and establish mines in any part of it. Engineers having reported favorably, work was commenced at once, over fifty miners being brought over from England. Unfortu-

[1] By an unfortunate accident my notes of the section at the mine, and of three other artificial sections, were lost.

nately the entire capital was exhausted in preliminary works, including the railroad to the river shore at São Jeronymo, and the company failed; the mine and railroad with all privileges, were sold at a low price, the purchasers being the house of Holtzweissig & Co., of Porto Alegre. The coal has since been worked by them, but on a small scale, the enterprise being in fact beyond their resources. The original horizontal mine of the English company was abandoned and the present perpendicular shaft was sunk; this is known as the Arroio dos Ratos mine. The quality of the coal varies somewhat, certain portions of it being interstratified with shaly rock, and containing lumps of iron pyrites. By experiments made on government steamers it appears that the average São Jeronymo coal gives, ton for ton, about thirty per cent less steam than good Cardiff coal; there is a proportionally larger quantity of ash, requiring more labor for its removal, but the engineers in this case reported little difficulty with clinkers or stones; other engineers, however, say that the furnaces become clogged, and they suggest a modification of the grates to meet the difficulty.[1] In igniting power the São Jeronymo coal is probably superior to the Cardiff, the fires being lighted and steam got up quicker with this than with the English coal. On the whole the São Jeronymo coal appears to be well enough fitted for stationary engines, freight locomotives and river steamers; for ocean steamers it may serve if mixed with better grades. It does not coke well, and its adaptability for gas making is doubtful. The coal is in good demand in the province, where English is very high, owing to the difficulty that coaling ships experience in passing the bar at Porto Alegre and Rio Grande. Comparing the prices paid at Porto Alegre and Rio Grande (April, 1882), I find that the São Jeronymo coal, where it can be used, is much cheaper. This will appear from a simple calculation:

Ths Sao Jeronymo coal costs at Porto Alegre..........	per ton,	15	milreis.
At Rio Grande..................................	"	18	"
Cardiff coal costs at Porto Alegre..................	"	32	"
At Rio Grande	"	28	"
Difference in favor of the Sao Jeronymo coal at Porto Alegre	"	17	"
At Rio Grande	"	10	"

The milreis, by present exchange, is worth about forty-four cents.

[1] Latterly the quality of the coal has been much better than when the experiments were made.

Allowing a difference of thirty per cent for the inferiority of the Brazilian coal and the greater labor required in using it, it would still have the advantage over the English coal in cheapness. If it were mined on a larger scale this advantage would be much greater, and if the difficulty of the bar could be overcome it might even pay to carry it to Rio de Janeiro and the Rio de la Plata. The Brazilian Minister of Marine, a year or two ago, offered to contract with Holtzweissig & Co., for the coaling of the government war steamers, the coal to be delivered in Rio de Janeiro; but the house being unable to comply with the conditions did not accept the contract.[1]

I am unable to compare the Rio Grande coal with that of Santa Catharina, but from such information as I can obtain, it appears that the mines of the latter province suffer the disadvantage of being too far from navigable waters, and especially from good ports. The São Jeronymo coal, on the contrary, requires only a short railroad transit, and it can be loaded directly at the river banks near São Jeronymo; large steamers, as I have said, ascend to this point.

The iron-ore bed, of which I have spoken, appears on the surface about two kilometers south of the coal mine, in the bed of a stream; the ore here is of reasonably good quality, but I do not think it would repay the cost of working, especially as the coal does not appear to be fitted for the reduction of metals. Beneath the surface the unweathered layer is comparatively poor in iron. It would appear, in fact, that a boring made beneath the coal in the Arroio dos Ratos mine passes directly through this layer, which is here indistinguishable from the rock above and below it.

Between the Rio Jacuhy and the first granite ridge the coal-bearing rocks again appear, but those on the surface are higher in the series than the section of the Arroio dos Ratos mine, and three trial borings have failed to reach profitable coal. In the last boring at Xarqueadas, twelve kilometers east of São Jeronymo, traces of petroleum were obtained.

The coal rocks in this basin are much obscured by eruptions of a dark, fine-grained basaltic rock, which is occasionally columnar; it is well seen about two kilometers S. W. of São Jeron-

[1] In practical questions relating to coal, the field geologist labors under great disadvantages, his opinion being in fact far less valuable than that of a competent engineer. The data on which the above paragraphs are based have been carefully collected from many sources, and used with much caution.

ymo, and farther on in the bed of the Arroio da Porteirinha. By the decomposition of this and of porphyritic rocks farther up the river, immense quantities of agates, chalcedonies and cornelians have been formed; very fine specimens may be picked up in the streets of São Jeronymo, and they are found all along the river shore to the mouth of the Arroio dos Ratos. Similar and still finer agates are found to the north and west of this point, some of them being nearly a meter in diameter; some of the finest are exported to Germany, and the trade is already of considerable importance. The price paid for agates in Porto Alegre is ten milreis, or about $4.40 per barrel.

The river shore at São Jeronymo and opposite Triumpho is formed of granite, this being the last that I have seen of the rock in this direction. The stratified beds farther north overlie the coal rocks. I shall have occasion to speak of them in another article.

In the bed of the Arroio da Porteirinha, and on the campos between it and the coal mine fragments of silicious wood are found; logs of this are so well preserved that they might readily be mistaken for half-rotten posts. Similar silicified wood occurs in large quantities in the districts to the north of the Jacuhy, but I have never found it in place. It is clearly much newer than the coal rocks, probably Quaternary or recent.

Passing in review the geological section which I have described, it will be seen that the basal granite forms a series, of east-and-west ridges, successively increasing in height from the Jacuhy to the Serra do Herval. The Serra, so far as I have any knowledge of it, is formed throughout of granite, and on the opposite or southern side there are other granite ridges, successively lower, to the Rio Camaquam; the coal rocks, if I may trust to the information of herdsmen, reappear in valleys between these. The Serra do Herval must therefore be considered as the backbone of an area of upheaval which raised not only the granite but the overlying gneiss and coal rocks. The dip and strike are modified by intrusions of trap, but the general inclination is always away from the central ridge. Thus, in passing north or south from the Serra do Herval we find successively newer rocks on the surface, and this rule holds good for some distance beyond the Jacuhy.

Unfortunately the age of the coal beds is still somewhat problematical, owing to the absence of fossils; the only recognizable

Allowing a difference of thirty per cent for the inferiority of the Brazilian coal and the greater labor required in using it, it would still have the advantage over the English coal in cheapness. If it were mined on a larger scale this advantage would be much greater, and if the difficulty of the bar could be overcome it might even pay to carry it to Rio de Janeiro and the Rio de la Plata. The Brazilian Minister of Marine, a year or two ago, offered to contract with Holtzweissig & Co., for the coaling of the government war steamers, the coal to be delivered in Rio de Janeiro; but the house being unable to comply with the conditions did not accept the contract.[1]

I am unable to compare the Rio Grande coal with that of Santa Catharina, but from such information as I can obtain, it appears that the mines of the latter province suffer the disadvantage of being too far from navigable waters, and especially from good ports. The São Jeronymo coal, on the contrary, requires only a short railroad transit, and it can be loaded directly at the river banks near São Jeronymo; large steamers, as I have said, ascend to this point.

The iron ore bed, of which I have spoken, appears on the surface about two kilometers south of the coal mine, in the bed of a stream; the ore here is of reasonably good quality, but I do not think it would repay the cost of working, especially as the coal does not appear to be fitted for the reduction of metals. Beneath the surface the unweathered layer is comparatively poor in iron. It would appear, in fact, that a boring made beneath the coal in the Arroio dos Ratos mine passes directly through this layer, which is here indistinguishable from the rock above and below it.

Between the Rio Jacuhy and the first granite ridge the coal-bearing rocks again appear, but those on the surface are higher in the series than the section of the Arroio dos Ratos mine, and three trial borings have failed to reach profitable coal. In the last boring at Xarqueadas, twelve kilometers east of São Jeronymo, traces of petroleum were obtained.

The coal rocks in this basin are much obscured by eruptions of a dark, fine-grained basaltic rock, which is occasionally columnar; it is well seen about two kilometers S. W. of São Jeron-

[1] In practical questions relating to coal, the field geologist labors under great disadvantages, his opinion being in fact far less valuable than that of a competent engineer. The data on which the above paragraphs are based have been carefully collected from many sources, and used with much caution.

ymo, and farther on in the bed of the Arroio da Porteirinha. By the decomposition of this and of porphyritic rocks farther up the river, immense quantities of agates, chalcedonies and cornelians have been formed; very fine specimens may be picked up in the streets of São Jeronymo, and they are found all along the river shore to the mouth of the Arroio dos Ratos. Similar and still finer agates are found to the north and west of this point, some of them being nearly a meter in diameter; some of the finest are exported to Germany, and the trade is already of considerable importance. The price paid for agates in Porto Alegre is ten milreis, or about $4.40 per barrel.

The river shore at São Jeronymo and opposite Triumpho is formed of granite, this being the last that I have seen of the rock in this direction. The stratified beds farther north overlie the coal rocks. I shall have occasion to speak of them in another article.

In the bed of the Arroio da Porteirinha, and on the campos between it and the coal mine fragments of silicious wood are found; logs of this are so well preserved that they might readily be mistaken for half-rotten posts. Similar silicified wood occurs in large quantities in the districts to the north of the Jacuhy, but I have never found it in place. It is clearly much newer than the coal rocks, probably Quaternary or recent.

Passing in review the geological section which I have described, it will be seen that the basal granite forms a series of east-and-west ridges, successively increasing in height from the Jacuhy to the Serra do Herval. The Serra, so far as I have any knowledge of it, is formed throughout of granite, and on the opposite or southern side there are other granite ridges, successively lower, to the Rio Camaquam; the coal rocks, if I may trust to the information of herdsmen, reappear in valleys between these. The Serra do Herval must therefore be considered as the backbone of an area of upheaval which raised not only the granite but the overlying gneiss and coal rocks. The dip and strike are modified by intrusions of trap, but the general inclination is always away from the central ridge. Thus, in passing north or south from the Serra do Herval we find successively newer rocks on the surface, and this rule holds good for some distance beyond the Jacuhy.

Unfortunately the age of the coal beds is still somewhat problematical, owing to the absence of fossils; the only recognizable

organic remains which I saw were some fragments of Lepidodendron from the strata immediately overlying the coal bed at the Arroio dos Ratos mine. These were much compressed and broken, but the generic characters were still clearly recognizable, and they are sufficient to establish the Paleozoic age of the beds. Beyond this I can only give it as my decided opinion that the coal rocks are of the Carboniferous period, and probably coeval with the Santa Catharina coal formations.

The question arises whether the coal beds were laid down in one sheet, which was subsequently folded as the ridges were formed, and then denuded over their tops; or whether the ridges already existed when the coal beds were formed, the latter having been deposited in the valleys between them? It appears to me that the ridges were partly raised before the coal beds were formed; that the latter were first laid down in the hollows, but gradually the upper beds extended over the granite hills. Subsequently the ridges were raised still higher, and the sedimentary rocks were denuded away from the granite on their summits. The original continuity of the beds appears to be proven by the general conformity of the sections in the three basins which I have described; but the inclination of the coal rocks is everywhere much less than that of the sides of the granite ridges.

Another question is important in an economical sense: Are there other beds of coal below that which is now worked in the Arroio dos Ratos mine? I think not. It seems certain that the section in this basin is the same as that at Dous Passaros, where the coal rocks lie directly on the granite, and no trace is seen of another coal bed below the iron-ore layer. As it appears that this latter bed has been cut in excavations made below the coal, I believe that further borings would only show layers of sandstone followed, at no great depth, by the granite.

——:o:——

ON THE SHELLS OF THE COLORADO DESERT AND THE REGION FARTHER EAST.[1]

BY ROBERT E.. C. STEARNS.

PART I.—THE PHYSAS OF INDIO.

ABOUT four years ago I called attention to certain specimens of fossil shells contained in a lump of earth taken from the

[1] This paper was read before the California Academy of Sciences, June 5, 1883. It may be regarded as supplementary to my "Remarks on Fossil Shells from the Colorado desert," published in the NATURALIST, Vol. XIII, March, 1879.

bottom of a well forty-five to forty-seven feet deep, at Walter's station on the Southern Pacific railroad, the level of the Colorado desert at that point being 195.54 feet below that of the ocean.

The specimen of earth was collected by Professor Davidson, who kindly submitted it for my investigation. Recently on his return from the Transit of Venus Observation station in New Mexico, he made a further examination in the desert, at Indio, a station on the same line of railroad, 109 miles north-westerly from Yuma (on the Colorado river), and thirteen miles this side, *i. e.*, northerly from Walter's,[1] where the previous collection was made. This new material is from the surface, at a point where the line of the road is twenty-seven feet below the level of the sea at low water.

The soil is of the same general character as that from the well, an exceedingly fine sediment, friable and readily separating in water. The Indio sample contains numerous micaceous particles, in this respect differing from the specimen of earth from Walter's station.

The molluscan forms include fragments of the valves of the common fresh-water mussel of the region, *Anodonta californiensis*, also the gasteropods, *Amnicola longinqua*, *Tryonia protea* (two

FIG. 1.—*Tryonia protea.*

varieties only, one smooth the other finely cancellated), also a collection of between eighty and ninety of the pond-snails, Physa, including perfect and imperfect specimens.

This portion of the collection is of special interest, as it furnishes a most satisfactory, because continuous, varietal chain connecting certain forms heretofore generally regarded as species, of which I have, on various occasions, expressed the opinion as be-

[1] These places are in San Diego county, along the western flank and nearly at the base of the San Bernardino mountains, which traverses the region diagonally in a north-westerly and south-easterly direction, from the northerly boundary of the State nearly to its southerly line, following the axis of the range, a length of about 150 miles.

ing at most but more or less colonial or local varieties of the same general form.

The species of Physa heretofore credited to the southern portion of California are *P. humerosa* and *P. virgata*. Binney[1] gives

FIG. 2.—*Physa humerosa* Gould. Natural size.

the localities of the former as "Colorado desert, Cal.; Pecos river," but at what point on said river is not stated. Cooper[2] credits it to "Pecos river, Texas," but why Texas I have been unable to discover, as the Pecos is a stream several hundred miles in length, extending from its tributary sources in the southerly subranges and lower flanks of the Rocky mountains throughout a large area in New Mexico, and nearly to the southerly line of Colorado Territory before reaching Texas; the omission or lack of precision is unfortunate. This is evident when it is seen that the Pecos is the main tributary of the Rio Grande, whose waters are the resulting accumulation of a drainage area farther east than any we have heretofore considered, extending in fact, in part, farther east than the easterly flank or foothills of the Rocky mountains, and discharging on the easterly or Atlantic side of the continent into the Gulf of Mexico. The occurrence of any of these forms which have been regarded as belonging to the fauna of the Pacific coast regions, with which we are familiar and to which your attention has been heretofore directed, within the area of more *easterly* faunal domains, has a most important significance as related to the variation or identity of species, and still more in its bearing upon the relation of faunal characteristics and specific characters to environmental conditions.

Still further to the east we have the Colorado of the east, or the Colorado of Texas (or little Colorado) as it is variously called, which also empties into the Gulf of Mexico, and drains an area estimated at 38,000 square miles, extending north-westerly toward the drainage basin of the Rio Pecos to the table plains of New Mexico and Texas, the Staked Plain so-called, or Llano

[1] L. and F. W. Shells of N. A.

[2] Geographical Catalogue, April, 1867, species 368, 369.

Estacado of the Spanish, a nearly barren waste whose general level is from 3000 to 4000 feet above that of the sea, its main features otherwise being like those of the great interior desert to the north-west, and that of the Colorado basin[1] in California.

Physa virgata Gld., is attributed by Binney[2] to Los Angeles, where I found it abundant in the basin of the fountain in the plaza near the Pico House, opposite the old parish church; also near San Diego and in the Gila river in Arizona, exact locality not stated.

Cooper[3] also gives its range as "Mojavé river to Gila river," on what authority as to Mojavé river and region I do not know.

As above suggested a glance at the map is necessary to obtain a clear idea of the extent of the area incidental to this discussion. San Diego county alone includes an area of over 15,000 square miles, and extends from the Pacific ocean to the Colorado river, its southerly boundary extending easterly along the Mexican line 175 miles to Fort Yuma, on the Colorado.

[1] The drainage area of the various basins, within which either of the West American forms of fresh-water Mollusca occur, to which reference has been made in this or previous papers of mine relating to the distribution of such forms, may be briefly stated (in square miles) as follows:

Columbia river	298,000
Colorado "	257,000
Rio Grande "	240,000

This of course includes that of its tributary the Rio Pecos, the same as the Colorado includes the Gila, etc.

Of the lesser basins the Sacramento is figured at 31,503, and the San Joaquin at 24,710 square miles, including the mountain slopes which descend to and merge in said plains; these are the figures kindly furnished me by Wm. H. Hall, Esq., the State engineer. From the Coast Survey department, Professor Davidson informs me that the great valley, including for example Napa and Alameda counties, contains 506.50 square miles; the two main drainage systems of the Sacramento and the San Joaquin and Tulare are nearly evenly divided.

It is not unlikely that the drainage of the California region, as related to those forms of animal life herein discussed, may reach the larger figures I have submitted, which added together make a total of over 56,000 square miles west of the crest line of the Sierra Nevada range, and if this total be added to the drainage areas of the exterior basins or regions above recited, show a grand total of 851,000 square miles, to say nothing of the vast area farther to the north not included within the figures or limits of the Columbia River basin.

Omitting the Rio Grande area, which may be considered by some as at present debatable ground, we have left 611,000 square miles, an area so vast as to require the examination of a map in order to be appreciated.

[2] L. and F. W. Shells of N. A., p. 93.

[3] Geographical Catalogue.

The typical form of *Physa humerosa* may be stated in brief as being rather short and stumpy, the upper part of the last or basal whorl flattened or tabulated, with a small, low, slightly elevated apex, as a whole presenting a somewhat obtuse triangular aspect. Its next of kin, geographically, is *P. virgata*, which is a rather elongated form with an elevated spire.

Now the Indio lot exhibits some examples more triangular in general outline and more tabulated or flattened above than the typical or even ordinary *humerosa*, and variation also in the direction of *virgata*, and still other specimens passing, by way of said species, to still greater elongation and elevation of the spire. Within these extremes of variation we have also a connecting link with the widely distributed and abundant *P. heterostropha*, which Binney[1] credits to Utah lake on the testimony of Capt. Burton's specimens in the Smithsonian collection, which brings that species within the drainage area of the Colorado river, and indicates the path of migration to the desert region wherein Indio and Walter's stations are situated.

Besides the forms and their varieties as above, we have extreme variation amounting to distortion in several instances—all pointing to this (Indio) locality as a most interesting region wherein to study the phenomena of variation in this class of shells.

In my recent paper on the Fresh-water Mussels, etc.,[2] more particularly in that portion on the circumboreal distribution of certain fresh-water gasteropods, I refer to the American *P. heterostropha* as representing the European *P. fontinalis;* the connection or intimacy of these various alleged species, as fresh material from new localities comes to hand, is evidently of great importance as throwing additional light on geographical distribution and physico-geographical conditions.

While Mr. Binney regards many of the species heretofore described as synonyms, and so places them in the work to which I have referred; he often gives but a single figure to illustrate such species as he regards as valid, and which include certain of these synonyms.

The variability of the pond snails is so excessive that it is quite impossible to present the protean facies they display with-

[1] L. and F. W. Shells of N. A., p. 89.

[2] Nov. 20, 1882, Proc. Cal. Acad. Sciences, "On the History and Distribution of the Fresh-water Mussels," &c., &c.

out numerous figures. In nearly every colony, however isolated, where individuals were at all numerous, I have rarely, if ever, found so persistent adherence to a single form as to admit of proper illustration by a single figure.

PART II.—ANODONTA CALIFORNIENSIS IN A NEW LOCALITY.

By the same mail which brought me the Indio parcel and Professor Davidson's letter relating thereto, a note came to hand from Mr. Joseph F. James, custodian of the Cincinnati Society of Natural History, who, after reading my recent paper on the "Fresh-water Mussels," etc., very kindly informed me that in June, 1880, he collected "*Anodonta californiensis* in the little

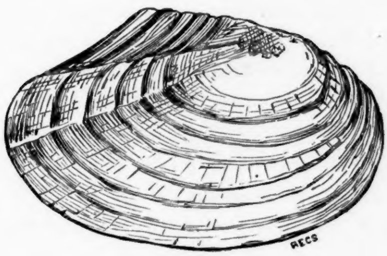

FIG. 3.—*Anodonta californiensis* Lea.

Santa Cruz river, just outside of Tucson, Arizona." This item of information gives quite an extension toward the east and southeast of the territory before known as tenanted by *californiensis*. The little Santa Cruz is a confluent of the Gila, and enters the latter at Gila Bend. The Gila is a confluent of the Colorado, joining the latter near Yuma. Tucson is about 250 miles east of Yuma, and following the course of the Gila to the mouth of the little Santa Cruz, thence southerly to Tucson, represents a subdrainage area of which the length is much greater.

An examination of a map of the region easterly and southeasterly of the main stream of the Colorado and of the drainage of the Gila, will enable one to take in at a glance the many streams which are tributary to and finally merge in the Gila and still later or afterward in the Colorado, which, together with the important fact furnished by Mr. James, warrant the inference that an exploration of the ramifications of the water channels of the region included within their net-work, will show that the domain

of this Anodonta extends over a vast area, embracing thousands of square miles of which as yet but little is known.

Every item bearing upon the geographical distribution herein referred to, and more elaborately discussed in my recent paper,[1] indicates the mountain lakes as the sources from whence the species have migrated, and point also to their descent from northerly regions as well as from higher altitudes, and also contribute additional testimony as to the antiquity of these widely-spread though inferior forms of animal life.

Admitting the presence of *Physa humerosa* within the drainage of the Pecos, to which we find it accredited, and considering the new locality for *Anodonta californiensis* which Mr. James has given us, and the fact that the *humerosa* form of Physa seems to be (geographically within the southerly portion of our West American or occidental Anodon province) a pretty constant companion with said fresh-water mussel, we are encouraged to hope that we may find this aspect of the general West American form of Anodon represented within such drainage areas as contain or are inhabited by the Physa.

——:o:——

REVIEW OF REPORT C_4 SECOND GEOLOGICAL SURVEY OF PENNSYLVANIA.

BY DR. PERSIFOR FRAZER.[2]

THIS new volume of the publications of the Pennsylvania Survey deserves much more than a passing notice, from the eminence of its editor and the number and nature of the criticisms which it challenges.

As to the latter they should commence with the title page, where, as will sufficiently appear further on, Mr. Hall would certainly repudiate the claim of having added materially to the structural geology of Chester county; indeed he has done so both personally to the writer and in his pages (54 to 64) of this volume. It will be advisable to consider his part of the volume first, but before doing so the writer wishes to protest against the heading of page 1, which should have been altered to conform to the title page. The

[1] On the History and Distribution of the Fresh-water Mussels, &c., &c. Proc. Cal. Acad., Nov. 20, 1882.

[2] C_4. Second Geological Survey of Pennsylvania. "The Geology of Chester County after the Surveys of H. D. Rogers, Persifor Frazer and Charles E. Hall. Edited by J. P. Lesley. Harrisburg, 1883."

three hundred and ninety-four pages which follow this heading are not in any sense a report of Persifor Frazer. That person is disposed rather to regard them as constituting a scrap-book of some new, some true, some old, and some other things originating from many persons, living and dead. One characteristic feature of the book is the way in which one of its parts stultifies another. After this perhaps comes the incongruous divisions of the subject (divisions as incommensurable as inches, pounds and years), which are woven together by the eminent editor so that the bewildered reader knows not whether he is reading Hartman, Rogers, Lesley or Hall, and only becomes aware after half the book is perused, that whoever else he may be reading it is not Frazer.

It is well known to most American and many European geologists that Rogers (and many other geologists of his time) was clearly mistaken as to the constitution of a large series of rocks which he called the "talc-mica" series, the error being that these rocks contained no talc whatever, the mineral that was taken for talc being a hydrous mica of the Damourite group. The term "talc-mica" had almost disappeared from the papers of those geologists who had kept up their lithology before the Second Geological Survey was commenced, and the directors of most of the State geological surveys (must we except that of Pennsylvania?) are aware how much the labors of various assistants of the latter survey have done to establish permanently, on a sound basis, the true relationships of those schists.

Yet the old name, "talc-mica" region, is retained as if it actually defined something, and not only in the quotations from Rogers, but in the numerous editorial comments. The magnesia which these schists are supposed to contain (contrary to the results of repeated analyses by Dr. T. S. Hunt, Dr. Genth, Mr. McCreath, the writer and many others) is made the basis of an hypothetical speculation as to the superposition of the South Valley Hill series on the limestone.[1]

[1] See p. 103, where also notice an argument in favor of the magnesian character of the schists "because they have always been known as the talc slate belt." The term talc-mica occurs continually throughout the volume wherever Professor Lesley's work appears, although it is universally conceded by geologists that the name was given under a misapprehension of the true nature of the hydromica schists which in reality contain no talc at all. Most reports and treatises on these rocks in the last ten years have recognized these facts, and none more so than the Second Geo-

Mr. Hall's "Notes," *i. e.*, pp. 54 to 64, are brought under a sub-heading of Rogers called the "Southern Gneiss." For some reason neither the colored map (presumably that on which the error of the county map-maker, in continuing a water course a very short distance too far along the Nottingham township border, was *not* "culpably copied")[1] nor the reduced page map is placed opposite to Mr. Hall's contribution, though he speaks in the first sentence of "the accompanying map," and he informed the present writer that this text was simply intended to explain that map and not to propound or support any theory whatever. This is plain in his pages, which are merely jottings from his field note-book. In his preliminary remarks he defines the areas of his map, which he has covered with certain symbols. All these general observations agree perfectly with those made by Dr. Frazer several years before Mr. Hall went to Chester county, printed in the descriptions of London Grove, New Garden and Kennett townships. Sufficient reasons are given in the latter places for believing that the same limestone underlies parts of these townships though "not visible at the surface." The rest of the "Notes" are simply localities where Mr. Hall has observed, "A. Laurentian syenite," "B. Sandstone and quartzite," "C. Limestone," "D. Hydromica schists," "E. Mica schists," and F. Serpentine." As to the latter he was "not able to convince himself of the true character of the deposit." While of E (mica schists) he frankly says: "As to structure I found it impossible to reconcile the stratigraphy of this part of Chester county with that of Delaware county by means of the numerous outcrops of rocks along nearly all the roads which cross the schist belt (if it be a belt), nor by means of

logical Survey. Thus Report C for 1874 has a description and analysis of these rocks (pp. 104 and 105) which seems to be conclusive as to their character. It concludes, "both the analyses tend to support the view that the mineral or minerals which give the unctuous feel and pearly lustre to the schists belong to the Hisingerite group of the Margarophyllite section of hydrous silicates (Dana's system)."

What makes this nomenclature the more unfortunate is, that there are, in certain localities, associated partly with the hydromicas and chlorites, well defined and veritable talc rocks which are thus confounded with the larger zone of which they form an important but very small geographical part.

[1] See p. 10. The implication here of carelessness on the part of Dr. Frazer is unfounded, as is also the statement that Northeast creek is made to head in Maryland and flow north into the Octoraro creek. The appearance of the branches of the Maryland stream is inconsistent with this statement.

the larger streams" (p. 60). So much for the text of Mr. Hall. There is not the slightest suggestion of a theory of any kind. It is in character like the record of facts contained in the "Township Geology," and it is nothing else; nor is there one fact added which is new, unless it be the "laurentian syenite" which in division "A" is called "syenitic gneiss," "syenitic rock" and "syenitic or granitoid rock." These exposures, though not indicated on Dr. Frazer's map, are described in the text of his Mémoire on this region printed in France and sent to the Geological Survey of Penna., in June, 1882, as well as in the township geology of the present volume. The reduced map of Mr. Hall has even less claim to originality than the "Notes," because the colored map of Chester county, in which exists the "culpably copied" error of Northeast creek, was printed in 1880–81. This map contains all the data which are found on Mr. Hall's map (except the areas of "syenite") and a great deal more beside. It is with the greatest respect for Mr. Hall, for his ability and for his work that the writer here says that the purpose that can be served by printing that part of the map opposite p. 6, which represents Chester county (a small part on the left), is very obscure. Of this map Professor Lesley says, "nothing is laid down which does not appear above the soil" (p. 33). However this may be (and it is not admitted), it is nevertheless true that many things appear above the soil which are not on Mr. Hall's map. The same authority (p. 37) states: "We owe to Mr. Hall's close and intelligent observation the collection of a large amount of satisfactory evidence for the general horizontality or low-dip angle of most of the rocks of this region [the "southern gneiss region"], whereas it had been taken for granted that a general steepness of dip prevailed."

Whatever may be Mr. Hall's contributions towards this knowledge the writer does not know, nor does he desire in the remotest degree to disparage them, yet the above editorial comment is most unjust to the earlier worker, who already had observed this fact in his study of Lancaster county, and subsequently made it a most important factor in the explanation of the intricate structure of Chester county near the Delaware State border. [See Mémoire sur la geologie de la Pennsylvanie. Lille, 1882. The horizon of the South Valley Hill rocks, Proc. Am. Phil. Soc., Dec. 15, 1882, pp. 322, 326,

328,[1] and many other places of the report under review, &c.]

The first chapter of the book under review (by the chief geologist, Professor J. P. Lesley) consists of thirty-two pages, of which the first six pages contain a general statistical account of the history, population, roads, &c., of Chester county. Here a division of the county into five regions is based upon Rogers's old system, and besides its very artificial character, contains faults which Rogers himself would probably not repeat now were he to re-write it.

These divisions are, 1st. "The southern region of Philadelphia gneiss," which neither Messrs. Hall nor Frazer have been able to adopt. This region is not defined by Professor Lesley, but judging from the water courses mentioned in connection with it, it includes much of the chlorite and hydromica schists.

Chapter II is the "Geological Description," and commences by alluding to the two maps of Chester county, one by Frazer, printed in 1880, and the other by Hall in 1882. The chief geologist here says, "Professor Frazer is dissatisfied with several details of the map as published, and especially with the manner of representing the hydromica schists south of the Chester valley." After repeating these objections in the Assistant's own words, Professor Lesley states the reasons for printing the map, with a division which Frazer had after two years' work failed to justify, to be that "had the pink color * * been given to the schist area * * it would have *confused the geology of south-eastern Chester*, Delaware, Montgomery and Berks." If the first of the list refers to Frazer's own interpretation of the geology, it is an error; and if it refers to the theories of Mr. Hall the pertinent question arises whether it is better that the map of a geologist should be allowed to agree with his own views and previously printed work, or altered in an important particular, in order that it might agree with the views of others? Even Mr. Hall will not take the responsibility of this change, for he says (p. 54), "The hydromica schists (of the South Valley Hill belt) spread through

[1] Speaking of feldspathic gneiss, which may be Potsdam, Frazer says in the last-quoted passage, "The dips in this area, in fact all the measures, are in unusual and very varying directions, and the angle with the horizontal plane usually low." These notes were made in 1879 or before Mr. Hall had expressed any opinion about the "southern gneiss region."

the south-west part of Chester county with a *somewhat indefinite line*," &c., &c.

It may not be entirely inapposite here to advert to the singular discrepancy between the principles and practice of one who but a little while ago plead so eloquently in the "Iron Manufacturer's Guide" and in "Coal and its Topography" for the rights of the subordinate geologist.[1]

In a great mass of description, taken bodily out of Professor Rogers's work, there is found even a description of a few lines given to Wood's chrome mine *in Lancaster county, made in 1853!* notwithstanding that this mine is treated quite fully as it exists today in Vol. C_3 on pp. 177, 192, 193, 194, 195 and 196, and specimens from it are recorded on pp. 286 and 287 of that volume.

A striking instance of the manner in which this volume is edited is exhibited on the page plate opposite p. 98, called "Three hypotheses of structure."

The upper (Fig. 1) is called "Theory of H. D. Rogers," the lower (or Fig. 3) is entitled "Theory of C. E. Hall," while the middle (Fig. 2) designed to embody the fault along the South Valley hill, is unmarked by the name of an author, though this is the view defended by Frazer, and letters have been received by the latter from many eminent geologists of the United States and Canada expressing their accord with it. The pre-Potsdam age of the South Valley Hill rocks was also strongly endorsed by Professors Gosselet and Barrois, who examined with great minuteness the theories of the geology of this region put forth in the Mémoire before alluded to.

A great deal of what has been objected to above may be conceded to the editor of C_4 because of the latter's own difference of opinion from that of Dr. Frazer, but this is not the case with all.

[1] In the preface to the "Iron Manufacturer's Guide," 1859, p. 9, Professor Lesley says: "One must take the names as and where they are published, whatever may be the unknown wrong done to the real workers and thinkers." Again, p. 668, in referring to a mistake made by Professor H. D. Rogers, he says: "His work is full of such blunders, the discredit of which would have been saved him had he given proper credit to his various authorities whenever it was due, or rather republished their own reports in their own language, as he should have done."

In the "Manual of Coal and its Topography" (a charming little book now unfortunately out of print) Professor Lesley says (p. 210): "No primary report should receive the touch of any hand but that of the first observer. Let it come fresh and clean before the examination of the world, and stand or fall (with its author) by its own merits."

On p. 104 Professor Lesley speaks of Dr. Hartman's geological map of Chester county as defining the S. E. limit of the "Talc-mica belt." On p. 105 he says, "*I* have defined such a border;" which language would imply that the supposed border between the hydro-mica and chloritic areas, which is given in the colored map, emanated from Dr. Hartman or Professor Lesley. The writer has never seen Dr. Hartman's map, but the chance of his boundary agreeing exactly with Dr. Frazer's in such a country is not one in millions. The boundary now printed on the colored map is the identical boundary traced provisionally by Dr. Frazer on his first manuscript map, and afterwards so completely disproved by its author that it was abandoned.

It will also strike the average reader as in questionable taste to refer (p. 106) to the supposed opinion of the late Professor John F. Frazer, which he entertained, if at all seriously, simply as an hypothesis which he never had the opportunity to decide; and to force Dr. Frazer into an apparent opposition to his father, by the misleading words that the latter "assisted Professor Rogers in 1853 and was personally very familiar with Chester county." Professor John F. Frazer did *not* study the geology of Chester county under Rogers nor subsequently, and he would have been the last to present the results of desultory observations during his visits for recreation as a definite theory founded on systematic work.

The third division is the "Downingtown valley," and the fourth the "Northern gneiss and Potsdam sandstone region." In this latter Professor Lesley follows Rogers, alluding to the "*greenstone trap*" traversing the shale, the fact being that if there be any greenstone in this region it has been entirely overlooked by subsequent observers, its quantity is very inconsiderable, and its importance entirely subordinate to that of the dolerites and syenites which make up almost, if not quite all, the igneous masses of the county. The fifth division is the Schuylkill region of Mesozoic Triassic (new red) sandstone and shale. To this is appended a short summary of the iron works, past and present, of the county.

A word is due in explanation of the character of Frazer's work (*i. e.*, Township Geology) which appears in C_4. Seven months of 1879 and five months of 1880 were spent by him in the collection of facts for the proper report on the geology of this most difficult region. It is probable that two more full seasons

would have been spent in Chester and the adjoining parts of Delaware and Montgomery counties before he would have felt ready to write their geology. Owing to the termination of his connection with the Second Geological Survey, and the consequent imperative demands upon his time of other occupations, such notes as he had made, which would otherwise have been ready in the early summer of 1881, were finished and sent to the Geological Survey in Feb. 1882, with the request that he be allowed to correct the proof; yet the first impressions seen by him were the stereotype or plate proofs of pp. 145 to 354 (without the illustrations). These were not received till the present year.

In the meantime Mr. Hall's Report C_6 had appeared,[1] and Professor Lesley had stated in the introduction that we could now "accept the Palæozoic age of the Philadelphia rocks with a moderately reserved confidence." This led to a paper on the horizon of the South Valley Hill rocks, before referred to, which was honored by favorable comment from a number of distinguished geologists, among whom was Professor Lesley himself.[2]

It is very much to be regretted that the generally valuable and justly admired volumes of the Second Geological Survey of Pennsylvania should be accompanied by a book of this kind. Not only can the text serve no useful purpose, except to indicate some dry facts obscured by a great deal of very unsound reasoning, but it cannot conceal by any amount of rhetoric the palpable fact that it is a make-shift, consisting of heterogeneous materials in juxtaposition but not joined together. The colored map, which represents a great deal of hard work, is defaced by a belt which has no existence in fact, as the writer well knows, for he sketched it as a working hypothesis and completely refuted it afterwards.

It is hardly unfair to say that if there were a museum for the preservation of teratological specimens of geological literature, this volume C_4 would be more fitly placed there than on the shelves with the best of its alphabetical sisters of the Second Geological Survey of Pennsylvania.

[1] October 24, 1882.

[2] Professor Lesley said in his remarks on the conclusion of the reading of the paper, that the subject therein treated had been constantly in his mind for many months, and he had come to the conclusion that the views just presented were the only safe ones to hold.

MEANS OF PLANT DISPERSION.

BY E. J. HILL.

(Continued from August number.)

III. A third agency in the distribution of plants is that of animals. The adaptations of fruits and seeds for this purpose commonly assume the form of hooks and spines, attached in various ways so as to secure their adhesion to animals. The attachment may be straight, but is more often curved, or if straight, provided with barbs. It may be only a slight hook, as in the curved beak of the fruit of *Ranunculus sceleratus*, or strongly hooked and barbed, as in the cockle-bur (*Xanthium strumarium*). Several of these contrivances deserve special notice.

In the order Leguminosæ, we find the pods of *Desmodium canescens*, and some others of the genus, covered with hairs having incurved tips, and easily adhering to the coat of any passing animal. In the order Rosaceæ some forms of Geum, notably *G. rivale*, have a persistent style, which, being bent or jointed and becoming hard when ripe, serves the same purpose. In Agrimonia the top-shaped persistent calyx is covered near the upper margin with hooked bristles which harden at the time of fruiting, and aid in attaching it. Among the Onagraceæ, the bur-like fruit of Circæa, or enchanter's nightshade, is covered with the same kind of curved hairs. In the Umbelliferæ, our two species of sanicle, *Sanicula marylandica* and *S. canadensis*, have the fruit thickly coated with hooked prickles. In Osmorhiza, or sweet cicely, the ribs of the fruit are barbed and cling to an object with considerable force. In the madder family several species of Galium have fruit in the form of a bur, furnished with hooked bristles.

But some of the best examples of this mode of attachment are in the Compositæ, in which exist so many cases of wind dispersion. The cockle-bur has already been mentioned. The involucre of the fruit is closed over the bony nut and clothed with hooked and roughened prickles, whose power of adhesion is too well known to need description. In the burdock (Lappa) each scale of the involucre ends in an awl-shaped, hooked appendage to scatter the heads of fruit, to the great annoyance of flocks and herds. In Coreopsis, or tick-seed, the modified pappus secures this result. The flat achenium is tipped with two straight awns, sharp and stiff, which act as spears to be thrust into the hairy or

wooly coats of animals. In the allied Bidens, or bur-marigold, the awns are downwardly barbed for more efficient action, and act on the principle of the fishhook. Let one but walk among these weeds in autumn, when the fruit is ripe and ready to be dispersed, and the utility of the apparatus at once becomes apparent.

Another family well represented by burs is the Borraginaceæ. In Echinospermum, or stick-seed, the margin of the nutlet is armed with one to three rows of prickles curved at the apex. In Cynoglossum, or tory-bur, three species of which are found in our Northern flora, the nutlets are covered with these barbed and incurved prickles. In regions where sheep are kept, the troublesomeness of the tory-bur and beggar's lice (*C. morisoni*) are only too well known.

One of the grasses is furnished with efficient means of dissemination by animals, *i. e.*, *Cenchrus tribuloides*, the sand-bur, growing abundantly in waste places and roadsides, in dry, sandy ground. The persistent involucre, enveloping the fruit, becomes dry and hard, and is covered with hooked spines, very adhesive to any soft object that comes in contact with them. Even some of the bearded grasses, like Elymus, with their rough awns, have some power of sticking to the coats of animals.

The agency of animals in diffusing the spores of cryptogamous plants must not be omitted. Insects, crawling over these when in fruit, must get their bodies well dusted with the microscopic spores, and carry them away, as in the analogous case of the pollen of flowers for cross-fertilization. The spores are sometimes roughened by minute projections, appearing granulated or even spinescent, like the pollen grains of Malvaceæ and many Compositæ, more adequately preparing them to cling to the bodies of insects and other animals. Several mosses have these roughened spores, as Aphanorhegma, *Pylaisæa velutina*, *Physcomitrium pyriforme*, *Trichostomum pallidum* and others that might be mentioned. That Bacteria and Micrococci are thus carried by animals is proved by recent research. When they are found in such vast numbers in the air, they must of necessity lodge on the bodies of animals and on plants that are in process of movement, and be dispersed in this manner. J. B. Schnetzler states "that the dejections of earthworms always contain numerous living Bacteria and their germs."[1]

[1] Journal of Royal Mic. Soc., Oct. 1882, p. 658.

The agency of animals in carrying fruits for food is an important factor in plant dispersion. They are often taken from the place of growth to be consumed in some other locality, or stored for future use. But all are not eaten. They may be dropped or abandoned. Accident or fright may lead the animal to relax its hold, and the fruit falls to the ground. The habit some animals have of burying fruit contributes still more effectually to this end, since some will escape consumption and be securely planted for growth. Busy rodents, apparently living for their own enjoyment, are contributing to the dissemination of their own food-plants. Darwin[1] states that earthworms are in the habit of lining their burrows, using seeds among other things, and that these sometimes sprout and grow. In this way these humble animals aid in spreading plants.

This is doubtless one of the ways in which acorns are scattered in regions of pine, which, cleared by the axe of the lumberman or destructive fire, soon yield a growth of oak, appearing almost spontaneously. The oaks found here and there in pine forests furnish the seeds; it only needs some mode of dissemination to plant them, like the agency of animals, wind and water. In passing through some of the burnt districts of Michigan, I have noticed that oaks sometimes escaped destruction by withstanding a fire that had killed nearly every pine, whose resinous bark invites death by fire. The scattered oaks stood ready to furnish the soil with another covering of trees, even if the ground were not already stocked with their germs.

In a similar way the habits of birds are available in the distribution of plants. Those yielding the softer fruits are largely dependent on them for dispersion. In the case of stone-fruits like plums and cherries, they eat the softer parts, the seed is generally untouched. And birds are wont to carry the fruit away from the tree that bears it, to be eaten elsewhere. The robin, woodpecker and other frugivorous birds, after plucking the dainty fruit are often seen to fly off with loaded beak. They may be carrying food to their young, but they are quite as apt to be seeking some better spot for the enjoyment of their meal. In either case the seed is scattered. And the seeds of many berries, hard achenia or minute stones or nuts, pass through the alimentary canal of birds and other animals undigested, and germinate from their

[1] Vegetable Mold and Earthworms, p. 113.

droppings. In this manner raspberries, blackberries, strawberries, the elder (Sambucus), poke (Phytolacca) and many others, which furnish food to birds, are multiplied.

It is therefore evident that the larger edible fruits, with their rich pulpy sarcocarp and much smaller volume of seed, do not exist alone for the animals that feed on them, but have another end to serve, the preservation of their kind. The more attractive the more likely to gain in the struggle for existence. If the color, form, odor, or any other peculiarity of a flower be explained on the principle that its end is the advantage of the plant bearing it, so we are to consider our various fruits as largely subject to the same law. There is mutual adaptation in the two kingdoms of nature, proceeding from its wise Author, but so far as the plant and animal are concerned, they are governed by a selfish principle, the law of self-preservation. The beauty we admire in the scarlet aril enclosing the seeds of the wax-work (Celastrus) and waahoo (Euonymus) when the pod opens to display them in the fall; the redness of the berries of the elder (*Sambucus pubens*), and of the mountain ash (*Pyrus americana*), are so many signals held out to attract the eye of the passing bird, inviting it to come and eat, however much they may contribute to the enjoyment of the eye that dwells upon their color.

IV. Another contrivance for spreading seed is the elastic movement of the coats of the seed-vessel at the time of maturity. Some of the best and most familiar examples are in the geranium family. The two wild species of Impatiens (*I. fulva* and *I. pallida*) are excellent cases of this kind. The walls of the ripened pods, still considerably succulent, suddenly contract and roll together, especially if some external stimulus be applied, as a touch or the action of the wind, and throw the seed outward to some distance from the plant. The wild species are exceedingly sensitive, opening so suddenly and at so slight a touch as to be almost startling in its unexpectedness, and hence have acquired their common name, touch-me-not. The wild geraniums possess this property, but to a less marked degree. The receptacle of the flower is prolonged into a slender beak, around which, at the base, the five cells of the capsule are arranged. Each cell tapers upward into a slender prolongation formed by the hardened style, and adheres to the beak at the top. When ripe they break away from the base, curl upward so as to bring the inside of the cell outward,

and in the elastic movement project the seed with force. The valves of the pods of violets also fold together when ripe, and throw out the seeds attached to the middle part of them. Hamamelis, or witch-hazel, is even more remarkable; the fruit is a two-celled, woody pod, opening at the top. Each cell usually contains but a single bony seed. When mature the outer coat of the cell separates from the inner, which encloses the seed. This, pressing the seed as it bursts elastically from the top, often throws it several feet as it escapes from the pressure, like a boy shooting a pea or bean by pressing it between the two parts of a split stick. These movements are generally due to the unequal tension of cells on the outer and inner sides of the walls, causing a rapid warping together in the direction of the greatest strain, and are similar to many other plant movements, like the bursting of the anthers in the barberry.[1]

It will be seen from what has been brought to notice that a great many kinds of plants are provided with means of dispersion, and that we can find genera and species in a large number of families that furnish examples of special contrivances. No effort has been made to be exhaustive in the treatment of the subject, even for our own flora, as it has not received sufficient attention to admit of this. But that the greater part of plants can avail themselves of some agency, either in themselves or their surroundings, or both, seems very evident; it may be said, scarcely admits of doubt. It is in accordance with the great plan of nature that all shall be cared for.

Nothing has been said about the indirect aid furnished by man any further than that of any animal. I have frequently been entertained, even if annoyed, while collecting plants, by an involuntary contribution to this work. With clothes well covered with burs and other adhesive fruits, the lesson has been learned to generally let them alone, not picking them off one by one, but leaving them to be brushed off in neighboring clumps of bushes or patches of grass that may soon be the place of search, where most will disappear and be left to propagate their kind. At some times of the year a day's work in gathering is also a day's work in dispersing. The indirect scattering of seeds by railroads, as

[1] Mr. J. C. Arthur, of Charles City, Iowa, being present at the reading of this paper, and engaging in the discussion that followed, stated that he had observed species of Euphorbia projecting their seeds with force from their pods.

the chief carriers of produce, with which seeds are more or less mixed, may also be noticed. That plants migrate along their road-beds, where they find a natural highway, is evident from the manner in which the plants of different regions are found to be mingled, when capable of this migration, going along step by step. But they too travel by rail, like members of the other kingdom of nature, and the diligent collector will from time to time be rewarded with a species new to his locality, which by its sudden appearance and isolation will not easily be accounted for in any other way.

In relation to what has been said, it is a matter of interest to compare plants and animals with reference to their distribution, and see which has the advantage in the struggle for existence. It may be thought that the free-moving animal excels the fixed plant in this respect. But a study of the whole life of each shows that many species of plants have the advantage over animals. If we compare the faunas and floras of the different continents, or of wide regions of the same continent, the number of plants of wide distribution much exceeds the number of animals. It is especially true of cryptogamous plants, and in the northern parts of the northern continents. Of the 2928 species of plants given in Gray's Manual of Botany, 2668 are indigenous, and 676 indigenous species are common to Europe, or twenty-five per cent. Of the mosses, including Hepaticæ, 502 are enumerated, 320 of which are found in Europe, or sixty-three per cent. Of the vascular Cryptogams, thirty-five of the seventy-five are common to the two continents, or about fifty per cent.[1] Some changes would have to be made in these figures if a comparison based on later discoveries were instituted, but not materially affecting the principle of distribution involved. This comparison is made between land and fresh-water plants and animals dwelling under the same conditions. It may be different with marine plants and animals. This advantage of the plant is doubtless in a great part attributable to its greater capability of enduring changes while in the act of migration. It is of a lower order of life, and less sensitive to change in some stages of its existence. Mountains, often of no great height, seas, often of no great width, are insuperable barriers to the migration of animals; they perish by cold, or hunger, or drowning, in their attempts to cross them.

[1] Gray's Manual of Botany with Mosses, 1856. Introduction.

But the embryo plant, wrapped in its seed or spore, more easily overcomes these obstacles. Before it becomes a rooted organism it has a greater freedom.

This idea may be enforced by quoting a few sentences from a work already referred to, that of Hildebrand: "It might seem that animals, in their ability to move freely over the surface of the earth, had a great advantage over plants in their dissemination. But plants find a compensation that more than offsets their lack of free movement. It consists in the fact that their descendants, before striking root in the ground, can, by means of various contrivances, be spread around the parent plant in a wide circle, and reach a place to which an animal can scarely attain, notwithstanding its ability to move freely. There are a great many obstacles which cannot be overcome by an animal that walks or flies. It is not able to pass over a chain of mountains of a certain height, or cross a broad expanse of water by swimming or flying. If permitted by its organization to live only in a marsh, it cannot wander from one marsh to another, or far away from the marsh in which it lives. No more can an animal, whose home is in the forest, master the difficulties of broad, treeless plains. But all these hindrances are more or less easily overcome by the seeds of plants. Being provided in themselves or their surroundings with the most varied equipments, they are borne far away by wind and water; and even in spreading obtain aid from the freedom of movement of animals, by whom they may be carried to distant places."[1]

——:o:——

IS THE GROUP ARTHROPODA A VALID ONE?

BY J. S. KINGSLEY.

SEVERAL years have passed since the four sub-kingdoms of Cuvier—radiates, mollusks, articulates and vertebrates—fell, more or less, into disuse, and now in their places we find a number of groups, varying according to the author followed. But by all the group Arthropoda is accepted, only a very few, in print, expressing any doubts as to its validity. The question of its naturalness we here propose to discuss in a very brief manner.

According to the old canons of classification, comparative anatomy was made the basis of systematic arrangement, and

[1] Die Verbreitungsmittel der Pflanzen, pp. 1, 2.

those animals which in their adult state possessed certain features in common were grouped together; but with the study of embryology and the introduction of the principles of evolution, this is gradually being set aside and only those forms are associated which are shown to have had a common ancestry and a common descent. Thus classification will eventually be founded on genetic relationships, and not primarily on analogies of structure and accidents of form produced by similarity of environment and similar causes without a common ancestry.

At first sight the homologies between the two groups of Arthropoda, Crustacea and Tracheata, seem very evident and easy to trace, the two groups appearing to be closely related. We find in each the same general features, a jointed body, each segment of which is, to a certain extent, a repetition of its immediate neighbors. To this jointed body are attached a varying number of jointed appendages each modified for the purpose of feeding, locomotion or reproduction. A straight alimentary canal traverses the body as an axis, and above it is found the dorsal vessel or functional heart, while on the floor of the body cavity is found the nervous cord, consisting of a series of ganglia connected by commissures, and in each group, when the œsophagus is reached, a commissure passes on either side connecting the ventral chain with the brain or supra-œsophageal ganglion.

Thus far our knowledge, derived from comparative anatomy, seems conclusive, but when we attempt to trace homologies farther, we become entangled in a snarl which we think cannot be untangled except by heroic treatment.

In the Crustacea the eyes, two pairs of antennæ and the simple median eyes of the young of many forms are innervated from the supra-œsophageal ganglion; in insects one pair of antennæ are entirely absent, and we have nothing to indicate whether the pair which exists corresponds to the antennæ or to the antennulæ of the Crustacean. In the insect the post-oral appendages of the head are three, mandibles, maxilla and labium; in the Crustacean we find the same number of cephalic appendages, mandibles, first and second maxillæ, but beyond this we cannot carry our homology in a serial order. And further, the appendages themselves in the two groups show very marked and important differences. In the Crustacea the typical structure is biramous; we have a basal joint bearing two jointed branches. These parts to be sure are not

evident in the adult of all forms, but they are almost invariably found in the young at some stage of development.[1] In insects the biramous structure of limb is never found,[2] the appendages in all Tracheata having a simple form consisting of a number of joints serially arranged. In the Crustacea the organs of respiration, when present, are either limbs modified for aerating the blood or are appendages borne on the limbs.[3] In the insects, when the respiratory organs are present, we find air-tubes or tracheæ permeating all parts of the body. In some forms no specialized organs for breathing are found, while in the higher Arachnida pulmonary sacs are found in addition to the tracheal system. To repeat, in the Crustacea the blood is brought to the oxygen, in the insect the air is carried to the blood.

When we turn to the alimentary tract we find an equally marked contrast between the two. In the Crustacea the primitive stomach (archenteron) is usually formed by an invagination, while in the insects this is never, so far as our present knowledge extends, the case. The various portions of the alimentary tract of the two groups are equally difficult to homologize; in fact, any attempts in this direction result in showing analogies rather than homologies, if we except the three grand divisions of proctodæum, stomodæum and mesenteron, common to all the higher Metazoa, and these divisions in their method of origin show as wide differences in the insects and in the Crustacea as they do in any two portions of the animal kingdom. In the Crustacea we find a more or less developed liver, while among the insects such an organ is not well differentiated, and on the other hand the salivary glands and malpighian vessels of the Tracheata are without parallel in the Crustacea.

In their development the Crustacea and Insecta show most markedly their diverse characters. The segmentation of each, as a rule, centrolecithal, but the importance of this similarity can be estimated when we reflect that in *Gammarus locusta* we have a total segmentation, while in the closely allied *G. pulex* it is partial. From this point on every stage of development shows

[1] As will be seen farther on the writer does not consider Limulus a Crustacean.

[2] With the solitary exceptions of Pauropus and Eurypauropus Ryder, where a biflagellate antenna is found, but which can hardly be regarded as invalidating the rule.

[3] The "lung" of Birgus and some of the land crabs is a secondary and adaptive feature, and has no importance in this connection.

diverging features, which, as they are well known, need not be repeated here. The whole course of development shows that the insects have been derived from a form like Peripatus, while the Crustacea have had an ancestor resembling the Nauplius of the Phyllopoda or the Copepoda. In both the insects and the Crustacea we have in the larval and in the adult state a serially segmented body with appendages on the metameres, but this merely points to a common Annelidan ancestor, and with the exception of the Mollusca is a feature common to almost all animals above the Cœlenterata. The ecdysis which occurs in the Arthropoda is not to be regarded as indicating close relationship, but rather as an adaptive feature, resulting from the unyielding character of the hardened integument. In short, the only point not to be easily explained, if we regard the two groups as not nearly related, is the compound eye common to both, and which occurs nowhere else in the animal kingdom. Still we have only to consider the close resemblance of the eyes of the vertebrates and of the dibranchiate Cephalopoda to see how little weight one organ can have in classification.

In the foregoing discussion, which is merely suggestive and by no means exhaustive, no attention has been paid to the Tardigrada, Pycnogonids, Limulus and Linguatulina. It may be that they will have to be elevated to groups each equivalent to the insects and Crustacea, or, as has been argued, that they are branches from the Arachnida. We do not at present know enough concerning the embryology of these groups to settle these points, but the little which we do know, when considered in connection with our anatomical data, is sufficient to show that none of them belong to the Crustacean Phylum.

——:o:——

THE SERPENTINE OF STATEN ISLAND, NEW YORK.[1]

BY T. STERRY HUNT, LL.D., F.R.S.

THE serpentine of Staten island appears as a north and south range of bold hills rising out of a plain of Mesozoic rocks On the west side are Triassic sandstones like those of the adjacent mainland, including a belt of intrusive diabase, and on the east the overlying and nearly horizontal Cretaceous marls, which are traced south and west into New Jersey. The only rocks be-

[1] Read at Minneapolis meeting of A. A. A. S., Aug. 21, 1883.

sides those here mentioned seen on the island, are small areas of coarse-grained granite, having the characters of a veinstone or endogenous mass, and others of an actinolite rock, both exposed among the sands on the north-east shore of the island.

Mather, who described this locality forty years since, looked upon the serpentine as an eruptive rock like the parallel belt of diabase seen to the west of it, but Dr. N. L. Britton, of the New York School of Mines, who in 1880 published in the Proceedings of the New York Academy of Sciences a description and geological map of the island, recognized the serpentine as similar to that which is stratified as a contemporaneous member in the ancient gneissic series of Manhatten island, and appears also at Hoboken, a view which is doubtless correct.

The appearance of isolated hills of serpentine rising among newer rocks is common in other regions, and is by the writer attributed to the fact that this insoluble magnesian silicate resists to a great degree the action of subaërial decay, which converts gneisses and other feldspathic rocks into a clay that is easily removed, leaving the beds and other lenticular masses of interbedded serpentine in relief. In many parts of Italy, where ridges or belts of serpentine protrude in the midst of Tertiary strata, they have been described by the earlier observers as eruptive masses. The question of their geognostical relations is there often complicated by the fact that subsequent movements of the earth's crust have involved alike the underlying serpentines and the newer strata, and have given rise to faults and inversions by which the younger rocks, overturned, are made to dip towards and even beneath the older. This condition of things the writer illustrated by reference to localities of serpentine lately scanned by him in Liguria and in Tuscany, where the true geognostical relations of these rocks had been first indicated by Gastaldi. The structure above described was farther explained by reference to the similar inversions of strata along the western base of the Atlantic belt from the Highlands of the Hudson southward along the Appalachian valley.

The writer stated that although serpentine, under subaërial influences, decays much less rapidly than the harder gneisses, it does not entirely escape this process. He showed that this rock on Staten island is covered in parts with a decayed layer, including portions of limonite separated by a process of segregation in

preglacial times, since in the subsequent erosion it has been removed from many parts of the serpentine belt. The details of this decomposition of the serpentine and of its relation to glacial erosion have been discussed by the writer in an essay on rock decay, to appear in the *American Journal of Science* for September, 1883. He acknowledged in conclusion his obligations to Dr. Britton for his careful description and for his personal guidance on Staten island.

——:o:——

A CLASSIFICATION OF THE NATURAL SCIENCES.[1]

BY T. STERRY HUNT, LL.D, F.R.S.

TO frame a rational classification of the natural sciences, and to define their mutual relations, has often been attempted. The present writer, in an essay read before the National Academy of Sciences in 1881, and published in the *L. E. & D. Philosophical Magazine* under the title of "The Domain of Physiology," suggested the basis of such a scheme, and now, at the suggestion of some of his readers, ventures to embody in a concise and tabulated form the views then and there enunciated, in the hope that other students may find it not unworthy of their notice.

The study of material nature, or of the physical universe (for the terms natural and physical are synonymous), constitutes what the older scholars correctly and comprehensively termed physics, and presents itself in a two-fold aspect; first, as descriptive, and second, as philosophical; a distinction embodied in the terms natural history and natural philosophy, or more concisely in the words physiography and physiology. The latter word has, from the time of Aristotle, been employed in this general sense to designate the philosophical study of nature, and will be so used in the present classification.

The world of nature is divided into the inorganic or mineralogical and the organic or biological kingdoms, the divisions of the latter into vegetable and animal being a subordinate one. The natural history or physiography of the inorganic kingdom takes cognizance of the sensible characters of mineral species, and gives us descriptive and systematic mineralogy, which have hitherto been restricted to native species, but in a wider sense include

[1] Read in general session at Minneapolis meeting of A. A. A. S., Aug., 1883.

all artificial species as well. The study of native mineral species, their aggregations, and their arrangement as constituents of our planet, is the object of geognosy and physical geography. The physiography of other worlds gives rise to descriptive astronomy.

The natural philosophy of the inorganic kingdom, or mineral physiology, is concerned, in the first place, with what is generally called dynamics or physics, including the phenomena of ordinary motion, sound, radiant energy, electricity and magnetism. Dynamics in the abstract regard matter in general, without relation to species; chemism generates therefrom mineralogical, or so-called chemical species, which, theoretically, may be supposed to be formed from a single elemental substance or *materia prima.* Dynamics and chemistry build up the inorganic world, giving rise to the science of geogeny and, as applied to other worlds, to theoretical astronomy.

Proceeding to the organic kingdom, its physiographic study leads us first to organography and then to descriptive and systematic botany and zoölogy, two great sub-divisions of natural history. Coming now to consider the physiological aspects of organic nature, we find besides the dynamical and chemical activities manifested in the mineral kingdom, other and higher ones which characterize the organic kingdom. On this higher plane of existence are found portions of matter which have become individualized, exhibit irritability, the power of growth by assimilation, and of reproduction, and moreover establish relations with the external world by the development of organs; all of which is foreign to the mineral kingdom. These new activities are often designated as vital, but since this term is generally made to include at the same time manifestations which are simply dynamical or chemical, I have elsewhere proposed for the activities characteristic of the organism the term biotics (Greek βιωτικος, pertaining to life).

The physiology of matter in the abstract is dynamical, that of mineral species is both dynamical and chemical, while that of organized forms is at once dynamical, chemical and biotical. The study of the biotical activities of matter leads to organogeny and morphology, while the relations of organisms to one another, and to the inorganic world, gives rise to physiological botany and physiological zoölogy. We thus attain to a comprehensive

and simple scheme of the natural sciences, which I have endeavored to set forth in the subjoined table:

NATURAL SCIENCES.	INORGANIC NATURE	ORGANIC NATURE.
DESCRIPTIVE. General Physiography or Natural History.	MINERAL PHYSIOGRAPHY. Descriptive and Systematic Mineralogy; Geognosy; Geography; Descriptive Astronomy.	BIOPHYSIOGRAPHY. Organography; Descriptive and Systematic Botany and Zoölogy.
PHILOSOPHICAL. General Physiology or Natural Philosophy.	MINERAL PHYSIOLOGY. *Dynamics or Physics:* *Chemistry.* Geogeny; Theoretical Astronomy.	BIOPHYSIOLOGY. *Biotics.* Organogeny; Morphology; Physiological Botany and Zoölogy.

——:o:——

EDITORS' TABLE.

EDITORS: A. S. PACKARD, JR., AND E. D. COPE.

—— Without doubt a most serious objection to the study of natural history, in the minds of young people and also older amateurs, is the technical language used by specialists. Nomenclature, botanical and zoölogical, is the *pons asinorum* of those who are not always dull in intellect, or who have even a smattering of Latin and Greek. Technical words, however, are necessary for brevity and conciseness of expression, and for use in a polyglot science.

Changes in nomenclature are also a great evil, vexing the amateur mind most sorely. But by the application of the law of priority and holding specialists to binomial names, we shall after awhile arrive at a reasonable amount of uniformity. The late Professor Wyman abominated excessive nomenclature, and used to declare his belief that specific and generic names should be abolished and species, at least, numbered 1, 2, 3, etc.

But now comes a new source of vexation to the lay biologist. We refer to the use of lower-case initials in writing the generic name, either alone or coupled with the specific name, with an initial in lower-case type. While certain ornithologists are to be condemned for using a cumbersome trinomial nomenclature, certain entomologists and editors adopt the usage of librarians and bibliomaniacs and write *Turdus migratorius*, *turdus migratorius*. We have of late years, for the sake of uniformity with English and German writers (though much against our will), written specific names derived from proper names in lower-case initials, and

so they are and have been for some years printed in this magazine, although we should prefer to follow the rules of English grammar, and the usage of botanists.

The latest abomination is that practiced by some entomologists in lists and catalogues, who begin all specific names with a capital. Now in the name of Linnæus and Lindley Murray combined, let us pause here. No well educated and sane person writes *john smith's Book* or *john Smith's Book*, but *John Smith's book*.

Can any one give us any good reason for not following the ordinary usage and writing the name of our common butterfly *Papilio Turnus*, the specific name being a proper one, rather than *papilio turnus* or *papilio Turnus?* or worst of all write the scientific name of the robin *Turdus Migratorius*.

Nomenclatural excesses or absurdities, trivial technicalities, in season and out of season, are the bane of modern biology, and we are glad that a natural disgust for these disagreeable concomitants of the study of living nature, tends to lead enthusiastic naturalists to eschew systematic biology, dried plants, dried skins and dried beetles, and to seek the woods and fields and observe the habits and instincts of living animals, or to undertake the more difficult and disciplinary anatomical and embryological fields of research.

Another argument is the increasing attention to be given hereafter in public schools to the study of biology. Botanists and zoölogists who write text books should bear in mind that a uniform nomenclature is of particular importance. Confusion and disgust should not result from the study of nature. What theologians are pleased to call the "natural" man rightfully rebels against an overstrung nomenclature. The biologico-pedagogical pill should be sugar-coated, or at least have no projecting angles.

——:o:——

RECENT LITERATURE.

WEISMANN'S STUDIES IN THE THEORY OF DESCENT.[1]—Next to the works of Darwin, Wallace and Fritz Müller, the present essay of Weismann's, which appeared in Germany several years since, is perhaps the most important contribution to the doctrine of evolution, and its appearance in an English dress, revised and annotated, should cause it to be widely read. The author's object was both philosophical and purely scientific. Besides endeavoring to test the capabilities of the known factors of transformation, the author discusses a question of wider importance,

[1] *Studies in the Theory of Descent.* By Dr. AUGUST WEISMANN. With notes and additions by the author. Translated and edited, with notes, by RAPHAEL MELDOLA. With a prefatory notice by CHARLES DARWIN. In 2 vols., with 8 colored plates. London, Sampson Low, Marston, Searle & Rivington, 1882. 8vo, pp. 729.

e., whether there exists a special "developmental force." This he believes cannot be decided by mere speculation, "it must also be attempted to approach it by the inductive method." While Weismann makes use of Darwin's principle of natural selection, he also accepts "the transforming influence of direct action, as upheld by Lamarck," although he adds, "its extent cannot as yet be estimated with any certainty."

The work consists of five essays. The first is on the "seasonal dimorphism of butterflies," in which the author attempts to discover the causes of this remarkable dimorphism, and by this means to indicate at the same time the extent of one of the transforming factors with reference to a definite case. How stimulating the facts and results given in this chapter are to entomologists, whether they are interested in the philosophic bearings of the fact or not, is well known; new and suggestive lines of research have been opened by the author, and in this country carried on by Mr. W. H. Edwards.

Weismann concludes from his studies in seasonal dimorphism, "that differences of specific value can originate through the direct action of external conditions of life only." He has certainly proved that new species arise by differences in climate, while he also (in a note to the English edition) concedes that sexual selection plays a very important part in the markings and coloring of butterflies, but he significantly adds, "that a change produced directly by climate may be still further increased by sexual selection."

A second point, and one of particular interest, which the author claims to be elucidated by seasonal dimorphism, is "the origin of variability." Having shown that "secondary forms are for the most part considerably more variable than primary forms," it follows that "similar external influences either induce different changes in the different individuals of a species, or else change all individuals in the same manner, variability arising only from the unequal time in which the individuals are exposed to the external influence. The latter is undoubtedly the case, as appears from the differences which are shown by the various individuals of a secondary form. These are," he adds, giving his proofs, "always only differences of degree and not of kind." He shows that allied species and genera, and even entire families (Pieridæ), "are changed by similar external inducing causes in the same manner, or better, in the same direction." He then concludes:

"In accordance with these facts the law may be stated, that in butterflies, at least, all the individuals of a species respond to the same external influences by similar changes, and that, consequently, the changes brought about by climatic influences take a fixed direction, determined by the physical constitution of the species. When, however, new climatic forms of butterflies, in

which natural selection is completely excluded, and the nature of the species itself definitely determines the direction of the changes, nevertheless show variability from the very beginning, we may venture to conclude that every transformation of a species generally begins with a fluctuation of its characters. But when we find the primary forms of butterflies always far more constant, this shows that the continued crossing of the individuals of a species to a certain extent balances the fluctuations of form. Both facts taken together confirm the law formerly enunciated by me,[1] that in every species a period of variability alternates with one of (relative) constancy—the latter indicating the culmination, and the former the beginning or end of its development."

He therefore formulates the chief results of his investigations thus: "A species is only caused to change through the influence of changing external conditions of life, this change being in a fixed direction which entirely depends on the physical nature of the varying organism, and is different in different species or even in the two sexes of the same species."

Weismann insists that too little is ascribed to the part played by the physical constitution of species in the history of their transformation, when the course of this transformation is attributed entirely to external conditions. "Darwin certainly admits the importance of this factor, but only so far as it concerns the individual variation, the nature of which appears to him to depend on the physical constitution of the species. I believe, however, that in this directive influence lies the precise reason why, under the most favorable external circumstances, a bird can never become transformed into a mammal, or to express myself generally, why, from a given starting point, the development of a particular species cannot now attain, even under the most favorable external conditions, any desired goal; and why, from this starting-point, given courses of development, even when of considerable latitude, must be restricted, just as a ball rolling down a hill is diverted by a fixed obstacle in a direction determined by the position of the latter, and depending on the direction of motion and the velocity at the moment of being diverted." Finally, he remarks: "If, under heredity, we comprise the totality of inheritance, that is to say, the physicial constitution of a species at any time, and therefore the restricted and, in the foregoing sense, predetermined power of variation, whilst under 'adaptation,' we comprehend the direct and indirect response of this physical constitution to the changes in the conditions of life. I can agree with Haeckel's mode of expression, and with him trace the transformation of species to the two factors of heredity and adaptation." It will be difficult to prove that the views here given are not impregnable, and that future advances in biology

[1] "See my essay, Ueber den Einfluss der Isolirung auf die Artbildung. Leipzig, 1872."

will not prove that external changes in the environment and heredity, are not the two fundamental factors in the origin of life-forms; natural and sexual selection playing a subordinate rôle, and rather preserving forms already originated than bringing about new biological creations.

The second part opens with a discussion of the origin of the markings of caterpillars, based on a knowledge of the early stages of the Sphingidæ, which the author's industry has almost alone furnished. His results certainly seem correct, and we think analogous though far less numerous facts concerning other groups of caterpillars, as well as saw-flies larvæ, which we have observed, will confirm Weismann's views. His evidence shows that there were once Sphinx larvæ without any markings, but with a caudal horn, as such a species now exists in the Berlin Museum. The characteristic caudal horn is older than existing markings. All the data go to show that of the three kinds of markings, *i. e.*, longitudinal and oblique stripes and spots, the first are the oldest, and of the longitudinal stripes the sub-dorsal originated before the dorsal and spiracular. The question as to the relative ages of the oblique lines and the spots does not admit of a general answer. The lines and spots are believed to have originated by the known factors of natural selection and "correlation" (Darwin), protective mimicry here acting as one of the factors of natural selection, the spots being of advantage to the larvæ.

The second section of this part is on phyletic parallelism in metamorphic species. The author attempts to show that the form-relationship of larvæ, especially caterpillars, does not always coincide with that of the imagines, or, in other words, a system based entirely on the morphology of the larvæ does not always coincide with that founded entirely on the morphology of the imagines. Space will not permit us to give an analysis of this section. Weismann here also is emphatic in stating that the external conditions of life produce the transformations and induce the organism to change. It seems to him "incomprehensible how one and the same vital force can in the same individual induce one stage to become transformed feebly and the other stage strongly, these transformations corresponding in extent with the stronger or weaker deviations in the conditions of life to which the organism is exposed in the two stages, to say nothing of the fact that by such unequal divergences the idea of a perfect system (creative thought) is completely upset."

The facts stated by the author in the third part relative to the metamorphosis of Siredon into Amblystoma are well known, as also his view, which we should question, that the Amblystomas which have been developed in captivity from *Siredon mexicanus* are not progressive but reversional forms. This view appears to us to be untenable, and not in accord with the metamorphosis of salamanders and even of Amblystoma in general. This chapter is

largely theoretical, and we doubt if the author's conclusions as to the reversion and causes of reversion can be proved, especially since the climate in Utah, where adult Siredons abound, is as dry as in Mexico.

In the fourth and last section of this part, while denying the existence of a "phyletic vital force," Weismann claims that while the processes and results of evolution are mechanical, and there is no *interference* of a directive teleological power in the processes of the universe, yet that in the beginning there was "an *appointment* of the forces producing them;" that the whole course of nature points back to a first Cause, a Creator; that mechanism and teleology do not exclude one another, but that there is a purpose in nature.

We take it that Weismann has been the first naturalist to show very plainly and simply, and by use of the inductive as well as deductive processes of thought, that teleology is not only possible but most probable. It seems to us he has afforded the clearest argument yet presented by an evolutionist for the existence of a First Cause. Hence materialism and teleology are opposite poles of the same truth. Weismann remarks: "I believe that I have shown that the theory of selection by no means leads—as is always assumed—to the denial of a teleological Universal Cause and to materialism, and I thereby hope that I have cleared the way for this doctrine, the importance of which it is scarcely possible to over estimate. Many, and not the most ill-informed, do not get so far as to make an unbiased examination in the facts, because they are at the outset alarmed by the to them inevitable consequence of the materialistic conception of the universe. Mechanism and teleology do not exclude one another, they are rather in mutual agreement. Without teleology there would be no mechanism, but only a confusion of crude forces; and without mechanism there would no teleology, for how could the latter otherwise effect its purpose?" Our author closes this admirable work with the following words: "The final and main result of this essay will thus be found in the attempted demonstration that the mechanical conception of nature very well admits of being united with a teleological conception of the universe."

MAYNARD'S MANUAL OF TAXIDERMY.[1]—The author of "The Naturalist's Guide" has, in this new venture, done a service to young ornithologists, and judging by the appreciation in which the present book is held by our son, a boy of eleven, who finds it to be a clear, intelligible and sufficiently brief description how to skin and stuff a bird, we have no doubt but that the book is what is required. Indeed the author has purposely avoided

[1] *Manual of Taxidermy.* A complete guide in collecting and preserving Birds and Mammals. By C. J. MAYNARD. Illustrated. Boston, S. E. Cassino & Co., 1883. 12mo, pp. 111.

lengthy instructions, but has rather sought to give a condensed statement of the results of an extended experience.

The book comprises instructions for collecting and skinning birds, making skins, mounting birds and making stands; also similar directions for collecting, skinning or preparing for the museum mammals as well as reptiles, batrachians and fishes.

The wood-cuts, though rude, are sufficiently well adapted for their purpose, and the book will be an indispensable guide to amateurs and useful even to experienced taxidermists.

SAUNDER'S INSECTS INJURIOUS TO FRUITS.[1]—This is a well prepared and very useful compilation from the works of our economic entomologists, coupled with the results of the experience and observation of twenty years. The work is thoroughly well done, both as regards its simple, clear style, its freedom from technicalities, its abundant and well printed illustrations (but few being poor, though most of them are familiar) and the judicious directions for removing the pests. To the fruit-grower it will be a great boon. The book is so well calculated to meet his every-day wants, that the demand for it will be and should be ever increasing. In other words the book is destined to be the standard authority on this all-important branch of applied entomology.

Although the wood-cuts and source of information are acknowledged in the preface with every disposition to give full credit to the original authorities, yet we should prefer to see an occasional reference in the body of the work to the author from whom detailed statements are taken. The average fruit-raiser will not care, perhaps, to be troubled with such reference, still it is giving farther credit to an author who has worked laboriously upon the life-history and ravages of some insect, and lends additional authority to the author's statements. This is not said by way of criticism, for our genial friend, the author, has done himself very great credit in this work, and rendered excellent service to agriculture as well as to beginners in entomology.

MASON'S MINUTE STRUCTURE OF THE CENTRAL NERVOUS SYSTEM OF CERTAIN REPTILES AND BATRACHIANS.[2]—This important work of Dr. J. J. Mason upon the minute structure of the central nervous system contains a magnificent series of plates, taken by the artotype process from negatives made by the author, illustrative of numerous reptiles and of the following batrachians: *Rana pipiens*, *R. halecina*, *Menopoma allegheniense*, *Diemyctylus torosus*, and *Siren lacertina*. Twelve sections of the spinal cord of Rana, five of that of Menopoma and two of that of Siren are given. The substantia reticularis, a network of connective tissue peculiar to

[1] *Insects Injurious to Fruits*. By WILLIAM SAUNDERS. Illustrated with 440 wood-cuts. Philadelphia, 1883, J. B. Lippincott & Co. 12mo, pp. 436. $3.00.

[2] *Minute Structure of the Central Nervous System of certain Reptiles and Batrachians of America*. Series A. By Dr. J. J. MASON. Newport, 1879–82.

the Batrachia, is well shown. It is noted that the relative thickness of the spinal cord in its anterior and posterior regions depends principally upon the extent to which the tail is developed. Five sections of the medulla oblongata, two of the cerebellum, seven of the optic lobes and eight of the cerebral lobes are given, also four of the nerve cells of Rana. The fullness of the oval formed by the spinal cord of Rana, in which the posterior fissure is little marked, contrasts greatly with the transverse enlargement and deep posterior fissure of the spinal cord of Menopoma. In the frog the cerebellum is placed vertically, and is independent of the optic lobes, while in the tailed Batrachia the latter seem to encroach on its substance. The writer disclaims sympathy with any theory which claims to distinguish between motor and sensory cells, and states that the hypothesis that the nuclei are the true functional centers of the nerve cells, is unproved.

RECENT BOOKS AND PAMPHLETS.

Owen, R.—Aspects of the body in Vertebrates and Invertebrates. London, Taylor & Francis, 1883. From the author.

Hale, Horatio—The Iroquois Book of Rites. D. G. Brinton, Phila., 1883. From the author.

Coburn, F. D.—Quarterly Report of the Kansas State Board of Agriculture, for the quarter ending Dec. 31, 1881. Topeka, Kansas, 1881. From the author.

S. A. Forbes.—Studies of the Food of Birds, Insects and Fishes, made at the Illinois State Laboratory of Natural History at Normal, Ill. 1883 From the author.

Le Conte, Jos.—On mineral vein formation now in progress at Sulphur Bank. Ext. Amer. Journal of Science.

——On the genesis of Metalliferous veins. Ext. idem., 1883. Both from the author.

Müller, F.—Die Verbreitung der beiden Viperarten in der Schweiz. Beiträge zum Nachtrag des Katalogs der herpetologischen Sammlung des Basler Museums. Basel, 1883. From the author.

——Dritter Nachtrag zum Katalog der herpetologischen Sammlung des Basler Museums. Amphibia und Reptilia. From the author.

Credner, Hermann.—Die Stegocephalen aus dem Rothliegenden des Plauen'schen Grundes bei Dresden. IV Theil. Berlin, 1883. From the author.

Putnam, F. W.—Iron from the Ohio mounds; a review of the statements and misconceptions of two writers of over sixty years ago. Cambridge, Mass., 1883. From the author.

Davis, N. S., Jr., and E. L. Rice.—List of Batrachia and Reptilia of Illinois. Bulletin No. III. Chicago Academy of Sciences, 1883. From the authors.

Doering, Adolfo.—Informe Oficial de la Comision Cientifica agregada al estado mayor general de la Expedicion al Rio Negro. I. Observaciones generales sobre la Fauna del Territorio conquistado. II. Enumeracion Sistemática de las Especies observados durante la expedicion. III. Geologia.

White, F. E.—Is the Blood a living fluid? Ext. Medical Record, 1883. From the author.

Benecke, K. A.—Beiträge zur Kenntniss der Fauna der Slavonischen Paludinenschichten. Separat-abdruck aus Beiträge zur Paläontologie Oesterreich-Ungarns und des Orients. Wien. From the author.

GENERAL NOTES.

GEOGRAPHY AND TRAVELS.[1]

AMERICA.—Mr. R. H. Major cites the record of Ivar Bardsen, a Greenlander, who wrote about 1349, to prove that the Oester Bygden, or East Bygd, was really situated upon the west coast of Greenland, instead of upon the east, as believed by Nordenskjöld. Bardsen commences his description at a highland called *Hvarf*, a word which means a turning-point, and is the same which in Scotland has been converted into Cape Wrath. He says: "*Under Hvarf lies Herjulfnaes, and the inhabited part of Greenland lying most to the east.*" Then proceeding eastward, he mentions only uninhabited fjords, and ends at an island named Karsoe, "beyond which nothing can be seen on sea or land but ice and snow."

Then returning to Hvarf he leads us westwards, and mentions, seriatim, localities whose names are also found in the Sagas and the other chorographies. Then occur these words, "*Northwards* from Ericksfjord are two arms of the sea, named Ydrevig and Indrevig. Next, *northwards* lies *Bredefjord; thence further to the north* is Eyrarfjord, and so on to Iselfjord, which is the most *westerly* fjord in the East Bygd." He then says that a space of twelve nautical miles of uninhabited coast separated the West from the East Bygd.

Mr. Major points out that this description can only be explained by referring Hvarf to Cape Farewell, or some headland near it, as, were it a point on the west coast, the succeeding places toward the west would be southward of each other instead of northward. He states also that the Nancy map, discovered by Nordenskiöld, has only the words "Gronlandia Provincia" within a fancy festooned line, while the Zeno map, which is a century earlier than the first voyage of Columbus, shows the entire coast, east and west.

Mr. R. B. White, who has surveyed the upper course of the Atrato, and resided a long time in Colombia, has given most important information respecting the little known central provinces of that country. The Andes in Colombia divide into three parallel ranges, of which the most western is the primitive chain, and consists of granites and diorites infinitely older than the volcanic rocks of the central chain, which are of Post-cretaceous or even Tertiary age. The continuity of the valley which separates these two chains is broken at a point nearer to its southern than its northern extremity by a great focus of volcanic action, represented by the volcanoes of Puracé, Sotará, etc. The upheaval at this point separates the valley of the Cauca, which flows northwards into the Magdalena, from that of the Patia, which flows south for 120 miles, and then turning abruptly westward along a

[1] This department is edited by W. N. LOCKINGTON, Philadelphia.

line of fault, finds its way to the Pacific through the wall of the western cordillera, the only great valley that breaks that continuous rampart from Patagonia to Darien. To the north of this a second area of upraised tablelands occurs, with the volcanoes of Herveo, Tolima and Santa Isabel on its southern limit, and there is no doubt that this upheaval once converted the valley of the Upper Cauca into a lake, but at length the river worked its way northward along a line of fracture parallel to the opposing western cordillera, and it now flows through one of the grandest ravines imaginable.

The State of Antioquia occupies this tableland, and is a rugged district with a healthy climate and a hardy, industrious population of 400,000, three-fourths of whom are whites, principally descended from emigrants from the north of Spain. The plateau is broken up by some deep valleys, among which are that of the Arma, 5000 feet deep, and of the Porce, which is even deeper.

The wonderful effects of the volcanic action to which this region has been subjected are evident from the facts that Cretaceous rocks exist 8000 feet above the sea, while in the central cordillera Post-tertiary gravels, such as occur at the sea-level, are found at a height of 6000 feet. Northward of Antioquia, and extending into its north-western extremity, are the extensive plains that occupy the lower course of the Cauca. These have a scanty population, for the lazy Negro of the coast has no tendency to spread inland, and the climate is too hot for the mountaineers of Antioquia. This plain is forest-covered, valuable dyewoods, timber, resins, balsams and gums are found, and the tallow-nut, ivory-nut, caoutchouc, ginger and ipecacuanha occur.

This region was called by the Indians Zenufana, or "Land of Gold." Its gold mines were worked by Indians, probably of a low grade of civilization, but tributaries of the higher races. A great Indian road, connecting Bogotá, the capital of the Zipa, with the Zenú and Darien kingdoms, traversed the country. The rivers of the more elevated regions are also rich in gold, and 15,000 of the natives of Antioquia are engaged in mining it.

The Patia valley has a climate of its own, intermediate between the hot damp climate of the coast and the warm dry valleys of the interior. Cacao flourishes near El Castigo, sometimes attaining a height of 120 feet; fine coffee is produced on the higher land, vanilla grows wild in such abundance that its long creeping roots obstruct passage through the woods, and caoutchouc, rare balsams and Brazil wood are found.

Before entering the Strait of Miramá, flanked by heights which tower to 10,000 or 12,000 feet, the Patia comes to rest in an immense pool surrounded by cliffs of slate rock, through which it finds an exit by a cleft not more than twelve feet wide. Through this it moves with a scarcely perceptible current and, therefore, since the river above the pool is in volume many times larger

than the Thames just above London the fissure must be very deep.

To the north-west of the western cordillera lie two rivers which repeat, on a smaller scale, the features observed in the Cauca and Patia. These are the Atrato and the San Juan, the former flowing northward into the Atlantic, the latter southward into the Pacific. Though much has been written about the Lower Atrato, the upper portion of the valley is less known. According to Mr. White, the river is navigable not only to Quibdó, where it is 250 yards wide, but to Lloró, which is in the midst of the upper basin, a region well adapted for agriculture, hilly but not mountainous, and covered with virgin forest. The higher portions of this valley (4000 to 5000 feet) are very healthy, and are diversified by open prairie. Here every kind of tropical produce may be cultivated, as the temperature ranges from 60° to 80°, caoutchouc and the ivory nut are abundant, and copper, coal and gold are met with.

The opening of a ship canal across the isthmus will render the lands of this elevated yet fertile region accessible, and the colonists are at hand in the neighboring State of Antioquia.

Indian cemeteries and sites of towns and villages are met with in great numbers among the forests, but from the known rapidity of growth of the trees in this region, as evidenced by the vegetation that stands on what are undoubted old Spanish mine-workings, it is probable that the trees are not more than 200 or 300 years old, and that at the time of the Spanish conquest much open land existed here, occupied by an agricultural Indian population, now practically extinct.

Mr. White has ascended the Cerro Torrá, a peculiar mountain about twenty-seven miles east of Novita, on the San Juan. This mountain, which abruptly terminates a ridge of hills, and rises about 12,600 feet above the sea, had not before been ascended. Its western face is a horse-shoe shaped amphitheatre which slopes regularly for half a mile or so, and then ends in a horse-shoe shaped precipice, down which hundreds of streams fall a sheer 3000 feet, to collect at its foot into the River Surama. The mountain consists of clay and mica slates, probably Jurassic, while the igneous rock, the eruption of which upheaved it, is syenitic granite.

A very large proportion of the platinum produced in the world is obtained from the Upper San Juan.

GEOLOGY AND PALÆONTOLOGY.

Mr. Rand on the Geological Survey of Chester and Delaware counties, Penna.—In Mr. Rand's communication he erroneously supposes that he is referred to as "skipping from his second to his third belt" of serpentine. The context makes it clear that it was the other and earlier geologist, Rogers, who is meant; the misprint of "when" instead of "where" (very often made by printers of this writer's MS.) may have clouded the meaning. He is in error in quoting as the writer's words, "approximately parallel beds." No such words occur on p. 523 or elsewhere. It was far from the writer's intention to criticize Mr. Rand for describing serpentine areas. His labors of love in mineralogy and geology are too valuable and too well known to the writer, but it was intended to defend Mr. Hall from what seemed to the undersigned an unjust accusation of carelessness and incompetency.

The writer has casually seen some serpentine outcrops in Lower Merion, but has never seriously studied them. At this time, while many miles away from both serpentine and note-books, he cannot vouch for what he might be able to prove in Lower Merion, Radnor or Upper Merion. He has little doubt, however, that he could find there, as he has in other counties, areas of serpentine of which no two field geologists would give the boundaries alike, and rocks which the most experienced lithologists would find it difficult to name and classify. The writer not having seen "masses of sand rocks of tons weight" in place where Mr. Rand supposes the Potsdam to be, cannot express an opinion, but if the evidence is there he will be glad to accept it, nor will it in any way affect his theory of the structure.

There is nothing in the language to which Mr. Rand refers without quoting, to justify his "if it is intended to convey the impression that I was guilty of plagiarism," &c., it may be ascribed to a desire to have a pretext for his joke. The art of assuming a fact, if you cannot find it, for rhetorical purposes is one of the characteristics of the bar. At the same time, up to the moment of reading Mr. Rand's remarks, the writer was under the impression that C_6 was published at the time he stated, and that impression is fully confirmed by a communication from Mr. F. W. Forman, of the geological office in Harrisburg station, that the "first issue of C_6 was October 24, 1882."

In Mr. Rand's didactic passage about natural science the writer follows him, simply repeating that he has neither "rejected, belittled nor ignored" Mr. Rand's work. What he has done is to point out the injustice of condemning the results of a fellow-worker in science, apparently because he does not happen to share his views.

In conclusion, the writer would suggest that there are worse things that might happen to the Geological and Mineralogical

Section than the awful fate Mr. Rand hints at.—*Persifor Frazer, Sea Girt, Aug., 1883.*

Atmospheric Dust and Disease Germs.—At a recent meeting of the San Francisco Microscopical Society Mr. H. G. Hanks read a paper on "Some notable features of the great San Francisco snow storm of December 31, 1882."

A storm of brief duration, resulting in the fall of a few inches of snow, would attract but little attention should it occur in the Eastern or Northern States of the Union, but at San Francisco, where such phenomena are almost unknown, the only instance on record during half a lifetime naturally became the absorbing topic of conversation. When, however, the warm air dissipated the snow and the streets of the city assumed their usual appearance, the wonderful snowstorm was forgotten. Apart from the storm being unusual and remarkable, there were certain features connected with it, both interesting and important, which, no doubt, escaped the notice of the casual observer, but to which my attention was drawn by accident. While the snow was falling, to all appearance clean and white, the idea occurred to me that it afforded an opportunity to obtain, without much trouble, a stock of pure water for chemical purposes. With this view I melted a quantity in a tin vessel in my private laboratory. To my surprise I found the resulting water milky, a deposit or residue of a muddy character remaining in the can. Without at first attaching any importance to the circumstance, I proceeded to filter the water, but found the filtrate still milky. Thinking the matter over, I determined to examine the residue under the microscope, when I found that I had in the field of the instrument finely divided sand, very much resembling that of the Great Colorado and Mojave deserts, with which I had become familiar in the course of recent microscopic investigations. With this clue I submitted the fine sand to a closer examination—mechanical, chemical and optical.

Under the microscope the dust was seen to be composed of rounded particles of quartz, with minute scales of mica, or jefferisite, and a large quantity of organic matter, principally vegetable fiber. On being calcined in a platinum dish, it at first burned, then blackened, and on continuing the heat to incineration, the mineral portion only remained, including a small ash. On cooling, the loss was found to be eighteen per cent, independent of moisture. The particles, measured with a Jackson micrometer, showed the larger to be 0.002 in., and the smaller 0.00005 in. in diameter. Thinking that some of the garden soil might have been taken up by accident, to remove all doubt I made a comparative examination to prove that the foreign matter in the snow did not come from that source.

While I was making these experiments a telegram appeared in

the city papers announcing a "shower of mud" at Fresno, which covered everything with a coating of gray, sandy mud. I immediately wrote to the telegraph operator, and received an answer and a sample of the mud or dust. An examination showed this substance to be nearly identical with that found in the San Francisco snow, the only important difference being that the particles were larger and the vegetable fiber more abundant.

About the same time L. Figuera, of Modesto, called at the Mining Bureau, and in answer to inquiries made by me, stated that the snow which fell at Modesto was discolored. On his return he sent me some of the dust which fell with the snow. Ten years ago snow fell at Modesto one inch deep, since which none has fallen. On the occasion of the great snowstorm the fall was seven inches, but the weather was so mild that no damage was done to animal or vegetable life.

The Modesto sand sample was found to be of the same general character, but the particles were larger than the others mentioned, and the organic matter was less, as follows:

Organic matter	14.4 per cent.
Largest particles	0.19 in.
Smallest particles	0.001 in.

The papers announced a sand storm at Bakersfield, and falling sand at Virginia city; soon after there was a sand storm in the Mohave desert, and at the same time a similar storm of great violence in Death valley, Inyo county, but all these occurred after the San Francisco storm and cannot be directly connected with it. A sand storm in a great desert is sometimes a serious matter; and although life be not in actual danger, the personal inconvenience is very great. It has been my fortune to experience more than one of these storms. The strong wind sweeping across the wide valleys lifts the sand in clouds which obscure the light of the sun, causing an unnatural gloom to hang over the landscape, which is at times wholly shut out from view.

Dust from the deserts of Africa has frequently fallen on the decks of ships in the Indian ocean and the Red sea, and on the summits of the highest accessible mountains, on the snow and even on the bare rocks, dust has been observed which has been called "star dust," "cosmical matter" and other similar names, which probably owe their origin to the causes I have mentioned.

The subject of atmospheric poison becomes important when it is considered that the dust I have examined contained so large a quantity of organic matter, of which, without doubt, a considerable part was in the form of germs. May it not be that the sudden and otherwise unaccountable appearance of strange plants, fungi and low forms of vegetable life, and perhaps diseases, may be due to this cause?

It is well known that on the most arid portions of the Colorado desert, when accidentally irrigated by the overflow of the river, a dense and luxuriant growth of vegetation springs up from seeds and germs which must have lain dormant for many years.

Certain localities in California have become unhealthy on the introduction of water for mining purposes or irrigation, and in many cases the country, before healthy, has become almost uninhabitable from this cause. May not the same effect be produced by germs brought by the winds? I leave the answers to these questions to members of our society who have made a special study of disease germs, and will conclude with a calculation I have made of the quantity of dust that fell in San Francisco, based on the weight obtained and quantity of snow, as found in my experiments. Of course such a calculation can only be roughly approximate. Without going into details, my calculation gives seventy-five tons to the square mile, supposing the fall to have been uniform. It is fair to assume that the upper air is frequently charged with dust, a portion of which falls near the source, while a larger portion is carried to unknown localities, and that the falling snow on the occasion of the December storm gathered it together and deposited it in our streets.

Dr. Sternberg addressed the society upon the points presented in Mr. Hanks' paper. He said he had spent much time in microscopical examination of atmospheric dust both in Havana and New Orleans, where he was studying the yellow fever and its communication. He found in the air spores of fungi foreign to the locality, which must have been brought great distances. This fact was also observed by Cunningham at Calcutta. Common air frequently contains, he said, starch granules and epithelial cells from the human skin, also fragments of cotton and wool fiber, &c. The first rain or fall of snow after a season of drought brings down all these matters from the air. In fact, the first rain gives the sewage of the atmosphere. Michel, in Paris, found the air loaded with germs of many kinds. He also found that filth diseases are most prevalent when the air contains most of these germs. But by all these air studies, conducted even in time of plagues, there has been no discovery which would connect certain diseases with any certain germ.—*English Mechanic.*

THE PROGRESS OF THE UNGULATES IN TERTIARY TIME.—At the late meeting of the American Association for the Advancement of Science in Minneapolis, Professor E. D. Cope read a paper on the Evidences of Evolution. Among the evidences cited were those furnished by the Ungulate Mammalia whose development since the beginning of Tertiary time (the Puerco epoch) is so distinctly marked in the skeleton and the brain. He gave a synopsis of these in tabular form as follows:

FORMATION.	NO. TOES.	FEET.	ASTRAGALUS.	CARPUS AND TARSUS.	ULNO-RADIUS DISTALLY.	SUPERIOR MOLARS.	ZYGAPOPHYSES.	BRAIN.
Miocene Upper .... (Loup Fork.)	1—1 2—2 3—3 4—4 (5—5)	Digitigrade. (Plantigrade.)	Grooved. (Flat.)	Interlocking. (Opposite.)	Faceted.	4-tubercles, crested and cemented.	Doubly involute. Singly do.	Hemispheres larger, convoluted.
Middle .... (John Day.)	2—2 3—3 4—4	Digitigrade.	Grooved.	Interlocking.	Faceted. Smooth.	4-tubercles, and crested.	Singly involute. Doubly do.	Hemispheres larger, convoluted.
Lower .... (White River.)	3—3 4—3 4—4	Digitigrade. Plantigrade.	Grooved.	Interlocking.	Smooth. Faceted.	4-tubercles, and crested.	? Singly involute.	Hemispheres small, and larger.
Eocene Upper .... (Bridger.)	3—3 4—3 4—5 5—5	(Digitigrade.) Plantigrade.	Grooved. (Flat.)	Opposite. Interlocking.	Smooth.	4-tubercles. 3-tubercles, and crested.	Singly involute. Plane.	Hemispheres small.
Middle .... (Wasatch.)	4—3 4—5 5—5	Plantigrade. (Digitigrade.)	Flat. (Grooved.)	Opposite. Interlocking.	Smooth.	4-tubercles. 3-tubercles, a few crested.	Plane. (Singly involute.)	Hemispheres small; mesencephalon sometimes exposed.
Lower .... (Puerco.)	5—5	Plantigrade.	Flat.	Opposite.	Smooth.	3-tubercles. (4-tubercles) none crested.	Plane.	Mesencephalon exposed; hemisphere small and smoother.

The primitive type remaining in the Loup Fork epoch is the Proboscidia.

GEOLOGICAL NOTES.—*Jurassic.*—M. Cotteau, in the sixty-sixth issue of the *Paleontologie Francaise*, describes the Jurassic species of the echinid genera Hemipedina and Cyphosoma. The latter genus attains its greatest development in the Turanian and Senonian stages of the Cretaceous, and is rare in the Jurassic.

Tertiary.—In Palæontological Bulletin, No. 36, Professor Cope adds to the fifty-five species of vertebrates of the Puerco epoch the ophidian *Helogras prisciformis*, and the mammals *Triïsodon levisianus*, *Mioclænus ferox*, *M. bucculentus*, *M. subtrigonus*, and *M. corrugatus*, two species of Mixodectes, new species of each of the genera Periptychus and Phenacodus.——MM. Schlumberger and Munier-Chalmus have proved that two species of Biloculina, now living in the Atlantic, are dimorphic, and have since ascertained that several Eocene Miliolidæ (Triloculina, etc.) are also dimorphic. The dimorphism, present in all the Miliolidæ examined, consists of a central chamber much smaller and surrounded by a greater number of chambers than the usual form. No young individuals of this second form have yet been found, and this fact tends to show, what from the character of the change is quite possible, that the form B is a final evolution of the form A.——Mr. J. L. Wortman, of Philadelphia, has published in the *Revue Scientifique* a most thorough account of the genealogy of the horse, illustrated with numerous engravings. Beginning in the Lower Eocene, he traces upwards the equine line through animals belonging, by the structure of their feet, to the Taxeopoda through the Lophiodontidæ, Chalicotheridæ and Palæotheridæ to the true Equidæ. The first traces of the preponderance of the central digit are found in the taxeopod Phenacodus; Hyracotherium follows, and the line then passes through the chalicothere Lambdotherium to Anchitherium, in which Palæotherid the foot has assumed an almost equine form. This genus belongs to the lower and middle Miocene, and in the beds immediately above it occurs Hippotherium, the incomplete fibula, small exterior digits, consolidated radius and ulna and horse-like teeth of which approximates it to Protohippus and to the true Equidæ, which follow in the upper Miocene, Pliocene and recent strata.

General.—Professor Hulke, in his anniversary address, reviews the work done during the year by the Geological Society. He notes as subversive of once generally received theories the fact that a much older fauna was found in the lowest of three gravel terraces in a river valley near Paris, than was afforded by the highest terrace; and also the illustrations repeatedly enforced to disprove the power of glaciers to excavate rock-basins.——Professor T. McK. Hughes has written graphi-

cally upon the relation of the appearance and duration of the various forms of life upon the earth to the breaks in the continuity of the sedimentary rocks. Postulating an earth-wave which should gradually force southward the depression of the Mediterranean, and thus convert Africa slowly into Europe, he endeavors to show what forms of life would be likely to persist. He then reviews some of the appearances and extinctions occurring in the various formations, and concludes that the sequence of life upon the earth points to the persistence of oceanic and continental areas, and to earth-movements of the nature of waves. The greatest breaks in the series of strata in England are those between the upper and lower old red sandstone, and between the Coal Measures and the Permian.

MINERALOGY.[1]

THE INFLUENCE OF LIGHT ON MINERALS.—It may not be generally known that many minerals lose their color or fade when exposed to light. Experienced collectors frequently keep their most finely colored specimens in a dark place. Fluorite is especially liable to fade. Amazon stone, however, sometimes gains in color when exposed to light. A greenish-gray feldspar from the graphic granite veins at Ammeberg has been found to assume a bright emerald green when exposed to the air. Experiments made by Erdmann, by placing fragments in sealed tubes and exposing them to light for a year, led to the conclusion that air and moisture had no influence, but that light alone effected the change in color.

RUTILE IN PHLOGOPITE.—The beautiful phenomenon of asterism is probably better shown in the well-known phlogopite of Burgess, Ontario county, Canada (often known as "star-mica"), than in any other substance. The flame of a candle looked at through a plate of the mica, appears as a six or twelve rayed star. As is shown by the microscope, this is due to the presence of minute linear crystals which cross each other at angles of 60°. The cause is the same as that which produces a two or four-rayed figure when a street lamp is looked at on a rainy night through an umbrella.

Mineralogists have long been puzzled to know precisely what these minute enclosed crystals are which thus produce the asterism, and they will be interested to know that they consist of *rutile.*

The needles are flattened and almost colorless in the Canadian mica, but in a mica from Bodenmais, Sandberger has found them of a deep reddish-brown color. Williams has also recently found needles of rutile in a magnesian mica which occurs in a mica diorite from the Black Forest.

[1] Edited by Professor H. CARVILL LEWIS, Academy of Natural Sciences, Philadelphia, to whom communications, papers for review, etc., should be sent.

A NEW USE FOR STRONTIANITE AND CELESTITE.—Quite a demand has recently sprung up for strontia minerals for use in separating sugar from molasses, especially for strontianite, and a good market is now open for that mineral. The strontianite is wanted for the preparation of strontium hydroxide, which has the property of precipitating sugar out of molasses. The mineral is ignited and then boiled with water, from which, on cooling, crystals of strontium hydroxide are formed. If this is heated with molasses and water a strontium saccharate is thrown down. This is filtered off, washed with a ten per cent strontium hydroxide solution, and then treated with water. It is thus decomposed and crystalline sugar is obtained on evaporating the filtrate.

"SULFURAIRES."—M. Plauchud, having shown that the presence of hydrogen sulphide in water containing vegetable matter is due to the action of some species of confervæ, which have the power of reducing sulphates to sulphides, formulates the theory that many of our natural mineral sulphides are due to the reducing action of this class of algæ. He sealed some of these algæ, which he designates "sulfuraires," between plates of gypsum, and after some months found granules of sulphur. Several other observers have noticed this chemical activity of certain algæ, and have shown that this action occurs only when the plants are alive.

CHLADNITE.—In 1846 Professor Shepard described under the name of chladnite a mineral which he regarded as a tersilicate of magnesia, which formed more than two-thirds of a meteorite which fell at Bishopville, S. C. The color of the mineral was snow-white, rarely tinged with gray, its luster was pearly to vitreous, it had a hardness of 6–6.5, specific gravity 3.116, and it fused readily before the blowpipe to a white enamel.

The meteorite was then investigated by W. S. von Walterhausen, who described the siliceous portion as containing ninety-five per cent of chladnite and the rest labradorite.

Still later Professor J. Lawrence Smith examined the meteorite, coming to the conclusion that chladnite was identical with enstatite. Rose and Rammelsberg also analyzed the chladnite, the latter stating that no feldspar was present.

Quite recently Dr. M. E. Wadsworth has examined the same meteorite and come to the conclusion that there is no such mineral as chladnite, and that it is an aggregate of enstatite, feldspar and augite; with traces of other minerals. The microscope clearly reveals the compound nature of the supposed mineral, which has a granitic structure and is a rock belonging to the gabbro variety of basalts.

That such diverse conclusions should thus be reached by the most able investigators seems indeed most strange. The conclusion of Dr. Wadsworth, undoubtedly the correct one, clearly

show the superiority of microscopical over chemical investigations in lithological work. Dr. Wadsworth supposes that the origin of the meteorite was similar to that of the terrestrial eruptive rocks. So many facts point to the essential unity of the universe that it is unwise to employ different names according as a rock comes from above or below. The name chladnite, either as rock or mineral, must therefore be abandoned.

NEW MINERALS.—M. Weibull describes as new three manganese minerals from Vester-Silfberg, Sweden, which occur with wad, manganesian garnet and manganiferous carbonate of lime.

Igelströmite, a silicate of iron and manganese, is a massive, dark-colored, crystalline mineral, having three cleavages, two of them distinct, and a vitreous to greasy luster. On the edges it is translucent with a yellowish color. Specific gravity 4.17. The composition is:

SiO_2	FeO	MnO	MgO	$CaCo_3$		
29.94	46.88	18.83	3.01	1.14	=	99.80

It appears to be merely a variety of knebelite, a mineral described more than fifty years ago by Döbereiner.

Silfbergite, apparently a manganiferous actinolite or anthophyllite, occurs in bladed crystals of a yellow color, resembling actinolite. Its cleavage, luster, hardness and specific gravity are about those of varieties of hornblende. Its composition is:

SiO_2	FeO	MnO	MgO	CaO	H_2O		
48.83	30.49	8.34	8.39	1.74	0.44	=	98.23

Manganhedenbergite, a manganiferous pyroxene, related to hedenbergite, is of a grayish-green color and has the general characters of the pyroxenes. Its composition is:

SiO_2	FeO	MnO	CaO	MgO	$\underbrace{Na_2O\ K_2O}$		
48.29	24.01	6.47	17.69	2.83	0.22	=	99.51

From the descriptions given it would appear that these minerals are all merely varieties of well-known species. If new names must be given in such cases it is most desirable that in some way they should recall that of the more generic mineral of which they are the varieties. It will, indeed, not be long before all mineral species will be divided and subdivided into genera, species and varieties, as has already been done for garnet, feldspar, hornblende, mica, etc. A mineralogical text-book will then be something more than a catalogue. Meanwhile mineralogists, describing new species, should indicate, if possible, their generic position.

MINERALOGICAL NOTES.—Mineralogists frequently have to test for phosphoric acid in a mineral under examination, and generally use molybdate of ammonia acidulated with nitric acid as a reagent, as prescribed in works on determinative mineralogy. By

adding a small crystal of nitrate of ammonia to the solution, the reaction becomes more delicate and the formation of the yellow precipitate occurs more rapidly.——Large deposits of mineral manure have been discovered in Russia. The deposits consist of a green sandstone and sand known as ancella-schicht. The sandstone consists of fifty per cent of calcium phosphate, twenty-five per cent of glauconite and ten per cent of quartz. The sand has forty per cent of glauconite. The sandstone is cemented by calcium phosphate, and is a most valuable manure.——Dr. Wadsworth has examined a supposed meteorite found at Waterville, Maine, just after the passage of a meteor over the town. The fragment was a cinder-like mass, the surface of which was coated by a fused crust. Although a report like that of a small cannon had been heard at the time the meteor was seen in the sky, suspicion was attached to this stone from the fact that the grass on which it lay was unchanged in appearance. Professor Shepard had analyzed it, but regarded it as doubtful. Examination showed that it was a slag-like body, long exposed to the action of the weather, and containing in its cavities remains of plant fibers. The fluidal structure and the fused matters seen under the microscope, showed that it was merely a slag from some earthenware manufactory, and in no sense a meteorite.——Some curious crystals of fluorite have recently been noticed from Bohemia. The crystals were combinations of cube, hexoctahedron and octahedron, remarkable for certain rectangular markings on the cubic faces. It has been shown that these markings are due to a double growth of the crystal whereby a simple crystal was first formed, afterward to be enclosed in a more complex crystal which was built up around the first. It is thus an enclosure of fluorite in fluorite.——Professor J. S. Newberry has contributed interesting articles on the formation of coal and the origin of carbonaceous matter in bituminous shales. He describes a number of facts regarding the bituminous coal fields of the Mississippi valley which clearly show that the "peat bog theory" gives the true explanation of the origin of that great deposit, as opposed to an "estuary or raft theory" now advocated by some geologists. He holds that the carbonaceous matter in bituminous shales is due to the presence of algæ, which thus are the primary source of petroleum and mineral gas.

BOTANY.[1]

The Growth of Plants in Acid Solutions. II.—Before the plants could be analytically examined they became disarranged and some identifications lost. The following items are interesting:

The hydrochloric acid plant was examined for chlorine, the

[1] **Edited by Prof. C. E. Bessey, Ames, Iowa.**

whole plant being divided into three parts. The top, embracing leaves and portion of stem, contained .205 grains of chlorine; the middle or stem to within a few millimeters of the first roots, .1373 grains of chlorine; the roots, .102 grains of chlorine. The sum of these amounts gave 3.54 per cent of chlorine in the entire plant. The hydrochloric acid formed soluble chlorides which were taken up by the plant. The percentage of chlorine in plants, excluding strand or beach plants, seldom exceeds one per cent.

The parts of another plant similarly divided into top, middle and roots, gave, upon maceration in warm water, an alkaline reaction which when titrated with acid, yielded the following results: the titration of the top converted into decinormal alkali equaled .294 grains carbonate soda; the middle gave .0432 grains, and the roots .049 grains carbonate of soda, or considering the alkali as soda, 1.3 per cent of soda for the whole plant, a fairly average percentage for plants of this description.

The percentage of ash of the other plants was determined in order to observe if the use of acid waters had increased the mineral matter of the plant through its solvent action upon inorganic ingredients of the soil. This examination gave the following results:

	Wt. dried plant.		*Percentage ash.*
Water plant	1.1615	grammes.	19.11
Carbolic acid plant	.5135	"	16.60
Nitric " "	.536	"	16.79
Formic " "	.5535	"	18.15
Salycylic " "	.5885	"	17.00
Tannic " "	.6975	"	19.80
Tartaric " "	.9325	"	14.74

Considering the devitalized condition of the acid plants mentioned above and the decreased weights of the others in this table below that of the water plant, it is evident that the acid waters tend to introduce inorganic ingredients into the tissue of the plants.

During the last winter I have kept hyacinth bulbs in acid waters identical with those used upon the geranium plants, adding to them oxalic acid. The effect upon the plants was deleterious and destructive. The water plant flowered upon March 7th, having numerous roots, a tall flower stalk and leaves six inches long. The hydrochloric acid bulb died, as did the sulphuric acid subject, though one month later. No roots appeared upon any acid bulb except a few in the tannic acid solution. The plants were low, the flowers appeared without scapes, and the leaves attained under these adverse circumstances, at the best, a height of three inches.

On March 31st the tannic acid bulb flowered and the flowers were a dark purple, much deeper in color than those of the water plant. The bulbs were supposed to be one variety, having all one

color. On April 1st the tartaric acid plant flowered, the flowers just emerging from the bulb. The citric acid plant flowered at the same time. The oxalic acid plant flourished better than the rest except that in tannic acid. On April 29th the nitric acid bulb pushed open a few pale flowers and died. This summer geranium plants will be watered with acid solutions, and grown upon siliceous, calcareous and feldspathic soils.—*L. P. Gratacap, 77th street and 8th avenue, New York city.*

REVISION OF THE NORTH AMERICAN TRIFOLII.—Lojacono, in the April number of *Nuovo Giornale Botanico Italiano,* attempts a revision of the North American Trifolii. The genus is divided into seven sections, under which the species are arranged as follows. The principal synonyms being given in parentheses:

Section I. AMORIA.

1. *T. bifidum* Gray, California. 2. *T. breweri* Watson, California. 3. *T. amabile* H. B. & K., California and Mexico. 4. *T. hemsleyi* Loja. (*T. amabile* of American authors), Mexico. 5. *T. potosanum* Loja., Mexico. 6. *T. goniocarpum* Loja., Mexico. 7. *T. ciliatum* Nutt., Western North America. 8. *T. gracilentum* Torr. & Gr., California. 9. *T. palmeri* Watson, Guadaloupe island. 10. *T. amphianthum* Torr. & Gr., Texas and Louisiana. 11. *T. reflexum* Linn., Canada to Florida and Texas. 12. *T. stoloniferum* Muhl., Ky., Ohio to Missouri. 13. *T. carolinianum* Michx., the Carolinas to Florida, Arkansas and Texas. 14. *T. bejariense* Moric. (*T. macrocalyx* Hook.), Texas.

Section II. LUPINASTER.

15. *T. parryi* Gray, Colorado. 16. *T. beckwithii* Brewer, California and Idaho. 17. *T. longipes* Nutt., Oregon and Rocky Mts. 18. *T. plumosum* Dougl., Oregon. 19. *T. gymnocarpon* Nutt., Rocky Mts. 20. *T. megacephalum* Nutt., California to Washington Territory and Utah. 21. *T. lemmonii* Watson, California. (By a curious error the second *m* of the specific name is changed to *n*, as it is also wherever Mr. Lemmon's name occurs, the latter always appearing as Lemnon!) 22. *T. plummeri* Lemmon, Pyramid lake. 23. *T. bolanderi* Gray, California. 24. *T. kingii* Watson, California and Utah. 25. *T. eriocephalum* Nutt., Oregon. 26. *T. altissimum* Dougl., Oregon and Idaho. 27. *T. andinum* Nutt., Rocky Mts. 28. *T. dasyphyllum* Torr. & Gr., Rocky Mts. 29. *T. brandegei* Watson, New Mexico to California. 30. *T. nanum* Torr., Colorado and Utah. 31. *T. andersonii* Gray, California, Nevada and Utah.

Section III. PHYSOSEMIUM.

32. *T. fucatum* Lindl., California. 33. *T. amplectens* Torr. & Gr., California and Guadaloupe island. 34. *T. depauperatum* Desv., California (also in Peru and Chili).

Section IV. INVOLUCRARIUM.

35. *T. spinulosum* Dougl., California. 36. *T. involucratum* Willd., California. 37. *T. heterodon* Nutt., California. 38. *T. nuttallii* Steud. (*T. polyphyllum* Nutt.), California. 39. *T. monathium* Gray, California. 40. *T. appendiculatum* Loja., (*T. obtusiflorum* Hook.), California. 41. *T. variegatum* Nutt., California. 42. *T. pauciflorum* Nutt., California. 43. *T. aciculare* Nutt., California. 44. *T. tridentatum* Lindl., California. 45. *T. watsonii* Loja., California. This is one of the many forms which have been hitherto considered varieties of *T. tridentatum.*

Section V. CYATHIFERUM.

46. *T. cyathiferum* Lind., Oregon and Rocky Mts. 47. *T. barbigerum* Torr., California. 48. *T. grayi* Loja. (*T. barbigerum*, var. *andrewsii* Kellogg), California.

Section VI. MICRANTHOIDEA.

49. *T. microdon* Hook., California and Oregon. 50. *T. circumdatum* Kunze

(not certainly known as North American). 51. *T. microcephalum* Pursh, Oregon and California.

Section VII. EULAGOPUS.

52. *T. macræi* Hook. (*T. albopurpureum* Torr. & Gr.), Western North America.
53. *T. neolagopus* Loja. (hitherto included under the preceding species), California.

The introduced species, which are often subspontaneous, are given by Lojacono as follows: *T. agrarium* Linn., *T. arvense* Linn., *T. medium* Linn., *T. patens* Schreb., *T. pratense* Linn., *T. procumbens* Schreb., *T. repens* Linn. It will be remembered that Dr. Gray says of the last in his Manual, "Here probably introduced, but indigenous northward."

LARGE FUNGI.—Last summer my attention was called to a large fungus growing on the trunk of an old "gum tree" (*Nyssa multiflora*) in the swamp near my house. On going to the place I saw, on the trunk of the tree, which was old and in places partially decayed, about twelve feet from the ground, a large, hemispherical, light colored protuberance which was evidently a fungus of some sort, but being above my reach I could not tell just what it was. I tried to loosen it with a pole, but it adhered so firmly to the trunk that this could not be accomplished. I therefore procured a short ladder, with the aid of which and a long-bladed knife, I cut away the specimen. It proved to be *Hydnum septentrionale* Fr., measuring one foot across, and weighing ten pounds. The mass consisted of about six horizontal layers, one above another, an inch or more thick, entirely free and separate from each other, except that they all proceeded from the same fleshy layer, which was firmly attached to the wood from which the fungus grew. The teeth which cover the lower surface of the horizontal layers are cylindrical, awl-shaped processes half an inch long or more, their extremities at first truncate with an imperfect fringe of short hairs, but the tips at length become acute. The whole is of a dull yellowish-white color and of a tough, fibrous, fleshy texture. The specimen described in N. Am. Fungi, which was found at West Chester, Pa., by Messrs. Everhart, Hairies, Jefferies and Gray, grew in a similar situation, on the trunk of a beech tree, just out of reach. Mr. D. L. James, of Cincinnati, Ohio, also mentioned that the specimens of *Trametes graveolens*, which are found there on beech trees, usually grow just out of reach on the standing trunks. On the other hand, of the numerous specimens of *Polyporus obtusus* (N. A. F., 389) growing on partly dead trunks of oak trees about Newfield, I have never seen but a single specimen that I could not readily reach standing on the ground. *Trametes pini* also is generally found near the ground, though occasionally a specimen is found fifteen or twenty feet from the ground growing from some dead place in the standing trunk.

It may be remarked that as a rule the large Polypori and Hydnums that grow on standing trunks, are found not far from the

ground, probably on account of the more abundant moisture which rises to a certain distance, even in the dead trunk, through capillary force.—*J. B. Ellis, Newfield, N. J.*

REVISION OF THE GENUS CLEMATIS OF THE UNITED STATES.—Joseph F. James has just published a revision of the genus Clematis of the United States in the Journal of the Cincinnati Society of Natural History (Vol. VI, July, 1883), the general conclusions of which are embodied in the following table:

		Section I. ATRAGENE.
1. C. verticillaris DC.	=	*Atragene americana* Sims., *A. columbiana* Nutt., *Clematis americana* Poir., *C. columbiana* T. & G.
2. C. alpina Mill.,		
var. ochotensis Gray	=	*Atragene alpina* Torr. *A. ochotensis* Pall.
		Section II. CLEMATIS.
3. C. baldwinii Torr. & Gr.		
4. C. douglasii Hooker	=	*C. wyethii* Nutt.
5. C. scottii Porter		
6. C. ochroleuca Aiton,	=	*C. ovata* Pursh, *C. sericea* Michx.
var. fremontii James	=	*C. fremontii* Watson.
7. C. viorna L.,	=	*Viorna urnigera* Spach.
var. coccinea James	=	*C. coccinea* Engelm., *C. texensis* Buckl.
var. pitcheri James	=	*C. pitcheri* Torr. & Gr., *C. filifera*, Benth.
8. C. bigelovii Torr.		
9. C. reticulata Walter		
10. C. crispa L.	=	*C. cordata* Sims., *C. cylindrica* Sims., *C. cylindrica*, var. *crispa* Wood, *C. divaricata*, Jacq., *C. simsii* Sweet, *C. viorna* Andr., *Viticelta crispa* Spach., *Clematitis crispa* Mœnch, *Viorna cylindrica* Spach.
var. walteri Gray	=	*C. cylindrica*, var. *lineariloba* Wood. *C. cylindrica*, var. *walteri* Wood. *C. lineariloba* DC., *C. walteri* Pursh.
11. C. lasiantha Nutt		
12. C. pauciflora Nutt		
13. C. drummondii Torr. & Gr.	=	*C. nervata* Benth.
14. C. virginiana L.	=	*C. cordata* Pursh, *C. cordifolia* Mœnch, *C. catesbyana*, Pursh, *C. fragrans* Salisb., *C. pennsylvanica* Donn, *C. purshii* Dietr.
var. bracteata DC.	=	*C. bracteata* Mœnch, *C. holosericea* Pursh.
15. C. ligusticifolia Nutt.	=	*C. virginiana* Hook. (in part, not Linn.)
var. brevifolia Nutt.		
var. bracteata Torr	=	*C. virginiana* Hook. (in part, not Linn.)
var. californica Watson	=	*C. ligusticifolia* Dur. & Hill (not Nutt.), *C. ligusticifolia*, var. *brevifolia* Benth. (not Nutt.)

THE BOTANICAL CLUB OF THE A. A. A. S.—There was such a gratifying attendance of botanists at the Minneapolis meeting of the American Association for the Advancement of Science that a meeting was called on Thursday afternoon, Aug. 16th. Twenty-five members, who are more or less interested in botanical studies, responded to the call. An informal organization was effected, and several committees were appointed. Several excursions were provided for, and arrangements were made for calling the club

together, from time to time, for the reading and discussion of papers, the exchange of notes, etc., while no small part of the profit of the organization of the club was found in the social enjoyment which it provided.

Dr. Beal, of Lansing, was made chairman, and Professor Coulter, editor of the *Botanical Gazette*, secretary. These officers are empowered to call a meeting of the club at Philadelphia next year. J. M. Coulter, of Crawfordsville, Ind., W. G. Farlow, of Cambridge, Mass., and C. E. Bessey, of Ames, Iowa, were appointed a committe to prepare a proper memorial to the Post-Office Department at Washington upon the postal regulations as to the transmission of botanical specimens through the mails. The committee invite correspondence upon this matter from botanists who have been annoyed by postal regulations.

PROFESSOR P. A SACCARDO'S SYLLOGE FUNGORUM OMNIUM HUCUSQUE COGNITORUM.—The second volume of this work is now issued. It contains 813 pages besides 69 pages of addenda, carrying the number of species up to 6180, which is supposed to include all the Pyrenomycetes thus far known. At the end of this volume is an alphabetical index of all the specific names in the two volumes, the generic name being added in parenthesis after each specific name.

Whatever may be thought of the many new genera into which the old genus Sphæria is here divided, there can be but one opinion as to the practical value of the work, which should be in the hands of every student of mycology. The third volume, embracing the lower orders of fungi, *i. e.*, Sphæropsideæ, Melanconieæ and Hyphomyceteæ, will be ready some time in 1884.—*J. B. Ellis, Newfield, N. J.*

BENTHAM AND HOOKER'S GENERA PLANTARUM.—Every botanist will rejoice that at last this great work has been completed, thus giving us a manual of the genera and orders of Phanerogamia. Volume I bears the dates of 1862 and 1867 for Parts I and II respectively; for Vol. II the dates are 1873 and 1876, while for Vol. III they are 1880 and 1883. The work has thus been under way for more than twenty years.

Part II of Vol. III, which completes the work, was received by botanists in this country about the first of June of this year. It is devoted entirely to the Monocotyledons, and will be interesting as furnishing, for the first time in many years, a definite arrangement of these plants. Seven "series," apparently about equivalent to the "cohorts" of Vols. I and II, include the thirty-four orders. These, with the orders they include, are as follows:

Series I. MICROSPERMÆ.—Hydrocharideæ, Burmanniaceæ, Orchideæ, the latter including Apostasiaceæ.

Series II. EPIGYNÆ.—Scitamineæ, Bromeliaceæ, Hæmodoraceæ, Irideæ, Amaryllideæ, Taccaceæ, Dioscoreaceæ.

Series III. CORONARIEÆ.—Roxburghiaceæ, Liliaceæ (which includes all the many tribes and suborders—Smiliaceæ, Melanthaceæ, Trilliaceæ, etc.—which have often been regarded as distinct orders), Pontederiaceæ, Philydraceæ, Xyrideæ, Mayaceæ, Commelinaceæ, Rapateaceæ.

Series IV. CALYCINÆ.—Flagellarieæ, Juncaceæ, Palmæ (including Phytelephasieæ and Nipaceæ).

Series V. NUDIFLORÆ. — Pandaneæ, Cyclanthaceæ, Typhaceæ, Aroideæ, Lemnaceæ.

Series VI. APOCARPÆ.—Triurideæ, Alismaceæ, Naiadaceæ (including Juncagineæ).

Series VII. GLUMACEÆ.—Eriocauleæ, Centrolepideæ, Restiaceæ, Cyperaceæ, Gramineæ.

With this volume we may now arrange the Monocotyledons in our herbaria with something like satisfaction, which before was impossible. The disposition of the genera in many orders, as for example in the Gramineæ, being very different from that heretofore followed, will necessitate some quite radical and at first confusing changes, but from our experience with the grasses under the new arrangement, we are confident that it will prove much more satisfactory than the old.—*C. E. Bessey.*

BOTANICAL NOTES.—At the meeting of the American Association for the Advancement of Science at Minneapolis, fifteen papers upon botanical subjects were presented, a larger number than for many years. The substance of some of these may be summarized as follows: Dr. E. L. Sturtevant pointed out an interesting parallelism between the structure of the kernels of maize and sorghum. In maize that structure has generally been regarded as the result of careful selection by man, but in sorghum, where we have exactly parallel structure, that explanation is untenable. ——Professor D. P. Penhallow, by careful measurements, determined the root and leaf areas to be approximately equal in the case of maize.——The box-huckleberry (*Vaccinium brachycerum* Michx., *Gaylussacia brachycera* Gray) was shown by Professor E. W. Claypole to be a species in the process of extinction. A small patch of a few acres in Perry county, Pa., and another in Delaware are singularly isolated.——Dr. Sturtevant presented his plans for an agricultural botany, showing that there are forms of cultivated plants which admit of as accurate definition and classification as the uncultivated ones.——Professor W. R. Dudley, from a study of the flora of Central New York, considers that it originated in the West and Northwest, that is, in what may be called the Central and Upper Mississippi valley.——*Sabbatia angularis* has been observed by Miss M. E. Murdfeldt to appear in one locality in Missouri at intervals of seven years. It will be interesting to know whether a similar periodicity has been noticed for this plant elsewhere.——The development of the dandelion flower has been made a special study by Professor J. M. Coulter during the present year. His paper will soon appear in full.——Dr. W. J. Beal brought forward numerous cases in the Gramineæ in which the lower sheaths of the leaves are *closed* as in sedges, instead of being *open* as is almost invariably stated in

descriptions.——J. C. Arthur described a minute fresh-water sea-weed (*Rivularia fluitans*) abounding in the lakes of Minnesota, and which has this year again apparently been poisonous to cattle. ——J. F. James argued that from structural and other characters the Compositæ should stand at the head of the vegetable kingdom.——At the meeting of the Society for the Promotion of Agricultural Science at Minneapolis, August 14th, Dr. W. G. Farlow presented a complete revision of the North American Peronosporeæ. The number of species has been greatly increased since his last revision in the Bulletin of the Bussey Institution in 1876.

ENTOMOLOGY.[1]

Entomology at Minneapolis.—Owing to the fact that there were no active members and but two honorary members of the Cambridge Entomological Club present at Minneapolis on the 14th of August, the meeting of said club announced for that day at 2 P. M. did not take place. On the next day, however, in obedience to a call made by Mr. J. A. Lintner, who was instructed at Montreal to fix a day of meeting, the entomologists of the association assembled and effected a temporary organization, before which Professor S. A. Forbes read a letter from Mr. Lintner expressing regrets at his inability to be present. The prevailing feeling at Montreal was explained by Mr. C. V. Riley, on whose motion the old Entomological Club of the A. A. A. S. was revived by the election of Dr. D. S. Kellicott, of Buffalo, N. Y., as president, Professor Herbert Osborn, of Ames, Ia., as vice-president, and Prof. O. S. Westcott, of Maywood, Ills., as secretary.

The old rules were adopted with the modification that instead of any member of the association interested in entomology being *ipse facto* a member of the club, registration is made a requisite of membership.

Three meetings were held, and the attendance comprised among others the following persons specially interested in entomology: D. S. Kellicott, P. R. Hoy, O. S. Westcott, Jenny Hoy, S. A. Forbes, G. H. Perkins, Mary E. Murtfeldt, E. S. Morse, Julius Pohlman, E. W. Claypole, Lillie J. Martin, Herbert Osborn, R. J. Mendenhall, Thos. S. Roberts, Wm. Saunders, C. E. Bessey, E. H. Canfield, Jno. Hicks, C. L. Herrick and C. V. Riley.

We give a brief account of the subjects presented and discussed, and shall in due time give abstracts of the papers of an entomological character read in Section F of the association.

Life-histories of Butterflies.—Mr. Wm. H. Edwards, of Coalburgh, W. Va., sent in the following recent experience in rearing Rhopalocera:

" I have *Colias barbara* larva past fourth molt, .65 in. long.

[1] This department is edited by Prof. C. V. Riley, Washington, D. C., to whom communications, books for notice, etc., should be sent.

"I have had from the egg Rutulus and Zolicaon. I have found that Rutulus is constantly distinguishable from Turnus, after first larval stage at least; that Zolicaon is closer to Asterias than to Machaon. I will figure the larvæ of both species in full and the imagos of Rutulus. I have had from egg and got drawings of *Colias amorphæ*, and I am not at all certain that it is *not a distinct* species from *C. eurydice*.

"I have had all stages of *M. chalcedon*, and had Phæton colonizing on same plant, so that I could compare the habits of the two species.

"I have had *Lycæna melissa* from egg to chrysalis, and the larva in last stages has the same organs on tenth and eleventh segments that pseudargiolus larva has, attracts ants in the same way, and gives them fluid to eat. And finally I have over 100 eggs of Parnassius, either *smintheus* or something close to it, perhaps *intermedius*, from West Montana.

"That is what I have done so far. I have had eggs of *Argynnis coronis* hatch (or perhaps it was *callippe*) but the larvæ died.

"As to butterflies this year, I have never seen them scarcer."

Notes on Pædisca scudderiana.—Mr. Riley exhibited plants of Solidago containing the larvæ of this species, and made some remarks on its habits which went to reconcile the published conclusions and differences between himself and Dr. Kellicott, and to show that while the insect is commonly a gall maker, it was also, exceptionally, an inquiline. The specimens showed that the habits of the insect were variable, and that the larva was either a leaf-crumpler, living in a bunch of curled terminal leaves held together by a silken gallery, a stem-borer, without causing any swelling, or the maker of a more or less perfect gall. He had also found it as an inquiline in the gall of *Gelechia gallæsolidaginis*, the gall of which was always distinguishable from that of the Pædisca; among other things by the burrow of the larva always being traceable from the blighted tip of the plant, whereas the Pædisca larva lived at first in the tip, and when making a gall always left the tip and bored in at the side. Dr. Kellicott's observations were accurate so far as they went, but did not take into account the variation in habit. Mr. Riley had watched these larval habits during the present year from the time of hatching, and had concluded that the insect combined, in varying degree, the four characteristics of gall-maker, leaf-crumpler, stem-borer and inquiline. The larva living in the crumpled leaves later in the season had not been reared to the imago, but he had made comparisons of the young larvæ and found that they were exactly alike, but they showed considerable modification as they developed, especially after the last molt. Several other microlepidopterous larvæ bored in the stems and lived among the leaves of Solidago; while another species, yet unbred, made a gall similar to that of Pædisca; but all the other larvæ known to him were easily distinguished from Pædisca.

D. S. Kellicott said that he felt sure that his observations as reported in the paper referred to were correct, and he was glad to know that both his own conclusions and those of Dr. Riley could be thus harmonized. It would seem he had not carried his observations far enough to discover that all the larvæ of *scudderiana* fed at first in the terminal leaves. Late in the fall he had often taken from the terminal leaves the mature larva referred to by Dr. Riley, but had so far failed to obtain the imago. He had some doubts about its being identical with *P. scudderiana.*

A Myrmicophilous Lepidopteron.—Mr. Riley also stated the life-habits of *Helia americalis*, which he finds in the larva state to feed in the nests of *Formica rufa.* So far as he knew this was the first Lepidopterous insect known to develop in ants' nests.—[*To be continued.*]

ENEMIES OF THE EGG-PLANT.—As an evidence that the appearance of *Cassida texana* and *Doryphora juncta* on the egg-plant, as referred to on p. 678 of last year's NATURALIST, was not accidental or temporary, we quote here a portion of a letter from Dr. A. Oemler, of Wilmington island, dated June 11th: "I have to report the appearance of *Cassida texana* on egg-plant more numerously and earlier than last season, having noticed it some weeks ago. The *D. juncta* is also plentiful. On two plants I found twenty-three larvæ on each, and nineteen on another, and neither were large plants. Besides the twenty-three larvæ I found on one of the plants four clusters of unhatched eggs, six perfect insects of the *texana* and thirteen larvæ."

THE PERIODICAL CICADA IN SOUTHEASTERN MASSACHUSETTS.—While driving across "the plains" of the central part of Martha's Vineyard, Mass., in the last few days of June of this year, I observed large numbers of the periodical Cicada (*Cicada septemdecim*). The scrub-oaks, which here cover the whole ground, were literally alive with them. Specimens of twigs containing eggs were secured, as also of the insects themselves and their abandoned pupa skins.

According to the article in the *American Entomologist* (Vol. I, pp. 63 to 72) these should belong to what is there called Brood XIV. That is, however, there recorded as appearing in Western New York, Western Pennsylvania and Eastern Ohio. Of Brood XV, which occurs in Virginia and North Carolina, the statement is made that "Dr. Harris records their appearance at Martha's Vineyard, Mass., in 1833. We have made some inquiry, but have not yet learned that they were there either in 1850 or in 1867. Hence we should rather infer that Dr. Harris's informant must have been mistaken." [*l. c.* p. 71.]

The insects were confined to a narrow belt not exceeding half or three-quarters of a mile in width and of unknown length, and posssibly this may account for the fact that the inquiries referred to above failed to elicit any knowledge of a previous visitation.

Supposing Dr. Harris to be right, we have here a slight acceleration in development, due probably to the well-known milder climate of the island.—*C. E. Bessey.*

[Professor Bessey is evidently correct in considering the limited appearance in Martha's Vineyard as a precursor to the Septendecim Brood XXI of our first Missouri Entomological Report, according to which it will appear next year in North Carolina and Central Virginia as well as in Martha's Vineyard. We have recently received from Loudon county, Virginia, through the National Museum, specimens which are also, in all probability, accelerated individuals of the same brood.]

HABITS OF MURMIDIUS.—The original home of this little brownish-red beetle is unknown, as is the case with most insects living in stored produce and which are now carried by commerce all over the globe. It occurs in old rice or straw, but does not appear to be very common in this country. We lately had an opportunity of observing it in vast numbers in old rice which had been kept in ill-closed bottles at the U. S. National Museum and which was received from South America. This rice swarmed with a large number of insects which are usually found in such places: among these were *Tenebrio molitor* and *T. obscurus, Calandra oryzæ, Ephestia zeæ, Silvanus surinamensis, Lepisma domestica, Trogosita mauritania.* Owing to its small size the Murmidius was less conspicuous than the above named species. Whether or not it was injurious to the rice could not be definitely ascertained, but the probabilities are that it fed only on the débris left by the working of the other species. It certainly does not bore in the kernels. Its larva was found hidden under the very fine débris and never attached to the kernels. It is of sluggish movements and very large when compared with the size of the imago. The most interesting point in the earlier history of this species is its pupa, which is remarkable from being enveloped in a cocoon spun by the larva. Not many cocoon-spinning Coleopterous larvæ are known thus far, but these occur among widely different families, viz., Gyrinidæ (no doubt all genera), Chrysomelidæ (Donacia and probably allied genera), Curculionidæ (Phytonomus and allied genera, Prionomerus). The small family Murmidiidæ must now be added to these. Whether or not the second representative of the family, viz., the genus Mychocerus, has the same habit as Murmidius remains uncertain. It occurs very rarely under fresh bark of deciduous trees in the Southeastern States. The cocoon of Murmidius is of dirty white silk and bears a certain resemblance in shape to that of the typical Noctuid egg, *i. e.*, having a broad circular base, the sides and top being rounded: this resemblance is further enhanced by the presence in the Murmidius cocoon of transverse and longitudinal ridges, though they are by no means so regular as in the Noctuid eggs.—*C. V. Riley.*

OBITUARY.—Entomologists will learn with deep regret of the death of V. T. Chambers, at Covington, Ky., on August 7th—his fifty-second birth-day. He was a lawyer by profession, and yet found time to do a great deal of entomological work. His writings have been confined almost exclusively to the Tineidæ, and all of his earlier papers were descriptive in their character and were published mainly in the *Canadian Entomologist.*

His later writings, published in *Psyche* and the *Cincinnati Quarterly Journal of Science*, dealt largely with the larval structure of the Tineidæ. In addition to these various articles, he published in Bulletin I, Vol. IV of the U. S. Geological and Geographical Survey, a list of "Tineina and their food-plants" and an "Index to the described Tineina of the United States." His collection was some years ago deposited with the Cambridge Museum of Comparative Zoölogy, and duplicates of many of his types are in the possession of private individuals.

Just as the proof of the above is being read, we are pained to learn that Mr. Townend Glover, for many years Government entomologist, died at the house of his adopted daughter in Baltimore, September 8th, from an attack of apoplexy. Mr. Glover published his first report under the Government in the year 1854, and from that year until 1878 nearly every volume of the Agricultural Reports contains something from his pen. He was born of English parents on the ocean, we believe, somewhere near Rio Janeiro, in 1813, so that at the time of his death he had entered upon his 71st year. He received his education in England, but came to this country when a very young man.

ENTOMOLOGICAL NOTES.—Mr. H. T. Stainton gives an interesting biographical sketch of Professor Zeller in the June number of the *Entomologists' Monthly Magazine*, and we are glad to learn that Zeller's collection has been purchased by Lord Walsingham. ——F. Brauer, according to a notice in the *Wiener Ent. Zeit.*, II, p. 155, records the larva of *Anthrax flava* as infesting Noctuid larvæ, and that of a Tabanus and of an Asilus as eating into a Coleopterous larva.——Jos. Mik (*ibid*, p. 156) confirms by observations of his own our conclusions as to the sarcophagous and non-parasitic nature of *Cyrtoneura stabulans.*——E. H. Jones describes and figures an abnormal larva of *Melanippe montanata* which possessed the antennæ and thoracic legs of the imago (*The Entomologist*, XVI, p. 121, June 1, 1883).——Mr. Newton B. Pierce, of Ludington, Mich., gave us a call recently on his way from Cambridge, Mass., where he has been studying Myrmelionidæ with Dr. Hagen. Mr. Pierce has already finished some plates of larvæ, and has made some interesting biographical discoveries. ——We learn from *Nature* that the Swedish Government has made provision for an entomologist, whose duty it will be to advise farmers as to the best means of destroying injurious insects.

——Dr. Hagen, of Cambridge, has had occasion to study somewhat Grote's nomenclature. He wrote us recently of *Aletia argillacea* Hübn., that he does not consider Hübner's few words a description; that the figure is different from *xylina* Say, and that the rejection of this last as having any priority in *argillacea* is entirely out of the question. We sometime since came to the same conclusion.——Professor Forbes, State entomologist of Illinois, recently sent out a circular statement of a new Dipterous wheat insect which he termed "the wheat-bulb worm," on account of its being found in the larval state at the base of the stem just above the root. From the figure and description we concluded that it would prove to be some small Muscid, but we did not expect it to prove to be the *Meromyza americana* Fitch, which more generally affects the base of the terminal joint. We learn from him (June 20), however, that such it has proved to be.——Part I of Vol. XXII of the Proceedings of the Boston Society of Natural History (May, 1882–November, 1882) contains the following entomological papers: Older fossil insects west of the Mississippi, by Samuel H. Scudder; Remarks on Scolopendrella and Polyxenus, by Samuel H. Scudder; Description of two interesting houses made by native Caddis-fly larvæ, by Cora H. Clarke; *Papilio machaon*, by H. A. Hagen.——Professor Planchon gives evidence of the permanent introduction and multiplication of our snowy tree-cricket (*Œcanthus niveus*) into the south of France (La Vigne Américaine, Vol. VII, April, 1883, p. 160).——Joseph Nusbaum gives grounds, from embryological studies, for the belief that the chorda dorsalis of vertebrates has its homologue in Arthropods in what Burger called the chorda supraspinalis (Zool. Anzeiger, No. 140).——We regret exceedingly to learn from a card received (July 1st) from his son, Mr. Geo. I. Bailey, that Dr. J. G. Bailey, of Albany, N. Y., died that day after a protracted illness. Dr. Bailey had long been interested in the Lepidoptera, and had accumulated a valuable collection. He had made a special study of the tree-boring species of the genus Cossus, and was engaged at the time of his death in the preparation of a paper for the Department of Agriculture.——Professor J. A. Lintner, in pursuance of a resolution passed at the meeting of the Ontario Entomological Society last fall at the Montreal meeting, has called a meeting of entomologists at Minneapolis, on the 15th of August. All interested in entomology are invited to attend.

Economic Notes.—The lesser migratory locust (*Caloptenus atlanis*) has proved extremely destructive in the Boscawen valley, New Hampshire, the present season.——Professor G. N. French, in the *Prairie Farmer* (June 16, 1883) mentions great injury to strawberries near Carbondale, Ills., by an undetermined Myriopod belonging to Chilopoda. A fuller account is given in *Farm, Herd and Home* for July.——The tarnished plant-bug

(*Capsus oblineatus*) has also proved very destructive to strawberries this year in Illinois.——Mr. Henry Edwards publishes (N. Y. *Evening Telegram*, July 3, 1883) a very instructive account of the work of *Orgyia leucostigma* on the shade trees in the squares and parks of New York city.——The army worm has attracted little attention this year, notwithstanding the spring and early summer were cool and moist. We have heard of it chiefly from Chester county, Pa.——The Hessian-fly has proved so destructive to wheat in Missouri, Kansas, Illinois, Indiana and Ohio, that much of the wheat was plowed up in consequence. Yet we doubt whether those entomologists who do not keep the run of agricultural news have been aware of the fact, or whether any specimens have been added to their cabinets.——Messrs. J. D. Peters and G. N. Milco had 300 acres of *Pyrethrum cinerariæfolium* in cultivation at Stockton, Cal., this year, and are extending the area of what they find to be a most profitable crop.

ZOÖLOGY.

HÆMATOZOA OF FISHES.—P. Mitrophanow gives some account of new monadiform parasites in the blood of fishes, and discusses their relations to the blood corpuscles. He points out that in consequence of their having been looked upon as curiosities, the literature that deals with the presence of foreign organisms in the blood of healthy animals, is in a very fragmentary condition. The author has discovered in the blood of *Cobitis fossilis* and of *Carassius vulgaris* an organism which at first sight appeared to be a Nematode, but which exhibited, on closer examination, no internal differentiation, and some amœboid characters. Of about 30-40 μ. long, it was only 1–1½ μ. broad, and moved with great rapidity; at its anterior end there was a flagellum of considerable length, and the anterior was narrower than the hinder end. When dying, or less active, the organism became much shorter, and an undulating membrane became apparent. The body of the organism, the membrane and the flagellum all exhibited a homogeneous highly refractive protoplasm of great contractile power. Some striking varieties of this form are described. The hæmatozoön found in *Carassius vulgaris* was at first sight similar to that found in *C. fossilis*, and just described, but it differed from it in its somewhat larger size and in the more distinct appearance of its undulating membrane. For the reception of these forms a new genus must be established which may be known as Hæmatomonas, and the two species as *H. cobitis* and *H. carassii.* After giving an exact definition of these forms, the author proceeds to refer to the views of Gaule, and states that he comes to the conclusion that he has here to do with organisms and not with the derivates of anatomical elements, and he agrees with Professor Ray Lankester that we have here Cytozoa. In consequence of the paper of the last-mentioned naturalist, he feels that it would

be superfluous to discuss in detail his objections to Gaule's views. —*Journ. Royal Microscopical Society, June.*

External Parasite of the Trout.—L. F. Henneguy describes, in the Comptes Rendus of the French Academy, an animalcule which covers the surface of young trout. When fixed, these infusoriform parasites have the appearance of small pyriform cells, fixed by their narrower end. When the infusorian is free it expands and has the form of a Haliotis shell. If the fish dies the infusorian guest abandons it and disappears, probably to take up its abode on another. Most nearly allied to *Bodo (Amphimonas) caudatus*, it is distinguished by having three instead of two flagella; the new form may be called *B. necator.* This, says the notice in the Journal of the Royal Microscopical Society, appears to be the first described external parasitic flagellate infusorian. It seems to cause the death of its host by giving rise to an alteration in the activity of the cells of the epithelium; for in a young trout the cells appear to be undergoing active division, which ceases when it becomes attacked by this parasite.

New Porto Rico Land Shells.—*Cistula consepta* and *Chondropoma tortolense* Pfr., var. *major*, are described by Professor E. von Martens, from Porto Rico. Thos. Bland appends a note (Annals N. Y. Acad. of Sci., pp. 370-371).—*A. F. Gray.*

Molting of the Apodemes in Crustacea.—F. Macquard, attracted by the recent statement of Vitzen that the apodemes, with some other parts, preserve their ordinary relations on the ecdysis of the lobster, notes that he has observed in the exuviation of the spiny lobster that the arcades formed by the mesophragms, and the longitudinal branches connected with them, are broken just as much as are also the endothoracic arcades and the paraphragmal pieces of the endosternites. In other words, all the connections between the mesophragms of the two sides, or of the same side, as well as of the paraphragmal and internal branches, are destroyed at the moment of ecdysis, and this destruction is prepared for by a decalcification and softening of these parts.

In the lobster, where the arrangements are a little different, we find likewise a division of the mesophragms along the middle line, and the separation of the branches of the endopleurites from those of the endosternites. Similar solutions of continuity may probably be detected in the apodemes of the Brachyura.—*Journ. Roy. Micr. Society.*

Molting of the Shell in Limulus.—The mode of molting of the crust or shell of the king or horseshoe crab (Limulus) has, we believe, never been described, although we have been familiar with it for a number of years; in fact, any boy who has been brought up along the shores of our bays and estuaries from

Casco bay southward, is familiar with the cast shells of this remarkable animal. When found in the course of molting the shell, the creature appears as if spewing itself out of itself, as the front edge or frontal doublure splits open around the extreme edge, the narrow rent, easily overlooked in the cast skin, ending, in a half-grown specimen six inches long, including the caudal spine, a little over half an inch from the acute hinder edge of the cephalothoracic shield. Not only is the outer shell cast, including all the spines and hairs, but also the chitinous lining of the œsophagus and proventriculus, the proventriculus corresponding to the stomodæum of the embryo. What we call the proventriculus corresponds to the "stomach" of authors, the true stomach not being lined with chitine. How much of the rectum is cast is uncertain, but the chitinous parts lying within the body and serving as attachments for the muscles moving the caudal spine, including two sets of slender, tendon-like processes, are cast. The gill plates are also cast, as well as the delicate hair-like setæ fringing their edges.

Moreover, and this is an interesting point, as in this respect the molted integument or shell of Limulus is like that of an Asaphus we have examined, the seven pairs of apodemes or internal processes, six pairs of which support the six pairs of abdominal feet, are also shed. This similarity of form in the apodemes of trilobites and Limulus has been, to our mind, a strong argument for the existence in trilobites of membranous abdominal swimming feet like those of the Limulus.

A small specimen taken in the act of molting, 50^{mm} long, including the caudal spine, and 30^{mm} broad, was considerably larger after casting its shell, measuring 65^{mm} in length, and 40^{mm} in breadth, or about one third larger.—*A. S. Packard, Jr.*

Crustacea of the New England coast, especially of the Gulf Stream slope.—The number of species of this class recently added to the faunal lists of this region is quite large, and the greater proportion, as was the case with the Anthozoa and Echinodermata, have been obtained from what is known as the "outer grounds" or "Gulf Stream slope," that is, from the slope uniting the continental plateau with the depths of the ocean basin. Along this slope flows the still comparatively warm water of the Gulf Stream, bearing with it many forms of animal life which were not previously known to occur north of the coast of Florida; while between it and the shore flow the cold waters of the polar current.

Many species of Crustacea, as of other animals, appear to live gregariously in this region, since great numbers may be obtained at a single haul in one spot, while at other spots, under similar conditions of depth, temperature and nature of bottom, few or none will be found. Thus at some spots 2000 or more of a species of Munida came up at one haul, at others the carideans, *Pontophilus brevirostris* Smith, and *Pandalus leptocerus* Smith, were ex-

ceedingly numerous; *Catapagurus socialis* Sm., was found in swarms at several spots, and at others the maioid *Euprognatha rostellifera* Stimpson, abounded.

Of *Parapagurus pilosimanus* Sm., about 400 examples were taken at one station in 312 fathoms, always associated with a polyp which builds itself around the crab and absorbs the shell it resides in. This species was previously known only from a few specimens taken by the Gloucester fishermen in deep water off Nova Scotia.

During 1882 Crustacea were less abundant than in previous years, but the large shrimps, *Pandalus leptocerus* and *P. propinquus*, occurred, the latter at depths of from 158 to 640 fathoms. Among the most interesting species were the large cancroid *Geryon quinquedens* Sm., which was taken in considerable numbers in from 322 to 452 fath. *Lithodes maia* abundant at 291 fath.; the macruran *Pentacheles sculptus* Sm., of the family Eryontidæ, a form known only by six examples; the Crangonids, *Ceraphilus agassizii* Sm., taken in from 291 to 640 fath., and *Sabinia princeps* Sm., in 374 to 452 fath.; *Hippolyte lilljeborgii* Danielsen, frequent in 144 to 640 fath.; *Janira spinosa* Harger, in 640 fath.; *Astacilla granulata* in 291 to 640 fath.; and *Boreomysis tridens* in 351 fath. Two new species of Galatheidæ, allied to Munida, were also taken.

The scarcity of many species, such as *Catapagurus socialis*, *Pontophilus brevirostris*, and a Munida which, though most abundant in 1881, was not seen at all in 1882, is accounted for by Professor Verrill by the occurrence of a severe storm which forced the belt of cold water outward into the area occupied ordinarily by the warmer water, thus lowering the temperature to a degree fatal to the more delicate forms.

Other forms of Crustacea described by Professor S. I. Smith from this region are *Amathia agassizii*, a small maioid found sparingly in depths of 262 to 340 fath.; *Lithodes agassizii*, of which about seven were dredged off Martha's Vineyard; *Eupagurus politus; Catapagurus gracilis; Pontophilus gracilis*, a shrimp with large eyes from a depth of above 300 fath.; *Rhacocaris agassizii*, *Rh. sculpta* and *Rh. longirostris*, three shrimps with greatly developed eyes, found at depths of 464 to 1186 fath.; *Anchistia tenella; Pandalus tenuipes*, *P. acanthonotus* and *P. carinatus; Miersia agassizii*, *M. gracilis* and *Meningodora mollis*, three Ephyrinæ from very deep water (the last in 1632 fath.), yet with a small black cornea on each eyestalk; *Eumeiersia ensifera;* the Penæidæ, *Benthesicymus bartletti*, known from a single example, at 732 fath.; *Amalopenæus elegans*, and *Hymenopenæus debilis*, and *Sergestes robustus*.

PROTECTIVE COLORATION IN PHRYNOSOMÆ.—The horned lizards, or toads, as they are usually called in California, exhibit considerable variation in color; I have collected them in Central Cali-

fornia (Placer county), and in the southern part of the State (Los Angeles county), and have seen many (just caught) specimens in the hands of others. The general tone or shade of color in each instance seemed to harmonize closely with the general tone of color of the earth or ground of the immediate locality or habitat. For this reason, when the little creatures are perfectly motionless, they are not easily detected. If the ground be of a yellowish, or ochraceous tone, the color of the lizard is so nearly the same as to excite attention to the fact; if of darker hue, or ashen gray, so with these lizards. I have frequently noticed this relation of color in these animals to environment, and have yet to find an exception to it; further than this, I am led to believe that a sufficient number of living specimens, will show a similar protective factor, in degree of development of the scale imbrications, tubercles so-called and horns—or, in brief, in the sculpture aspect as related to the surface texture of the ground which forms the local habitat of these forms.—*R. E. C. Stearns.*

THE GARDENER BIRD (AMBLYORNIS INORNATA).—This bird appears, from the studies of M. Beccari, to excel the Australian bower-birds, to which it has affinities, in the erection of a pleasure bower. A small shrub in an open spot in the forest forms the center of the edifice. Moss is piled around this and then a number of branches plucked from an epiphyte are planted in the soil in an inclined position, so that they form the walls of a conical hut entered by a small opening, These branches continue for some time to vegetate. Before the entrance the bird makes a lawn of tufts of moss carefully separated from all pebbles, bits of wood or other plants. On this green carpet he strews the violet fruits of Garcinia and the flowers of a Vaccinium that grows near, renewing them when they wither. The bird is a native of the Arfak mountains in New Guinea, and the first report of its existence was brought M. Bruijn by Malaysians.

TENGMALM'S OWL.—This little owl of the North, but slightly larger than the common Acadian owl, is not a very common species within the limits of the United States, although it may be a regular winter visitant, and it is not improbable that it will be found breedıng in the northernmost part of New England. I am indebte dto Mr. Montague Chamberlain, of St. John, N. B., for notes concerning the occurrence of Tengmalm's owl in Southern New Brunswick in summer. "One shot by Mr. James Garnett, of Garnett's stream, ten miles east of St. John city, in the middle of August, 1880. Mr. Garnett shot another at the same place December 31, 1881." Audubon recorded the occurrence of this species at Bangor, Me., "in the beginning of September." For a note of its capture in spring I am indebted to Mr. A. M. Tufts, who obtained a male specimen taken at Dexter, Me., in April, 1877; also a female specimen taken near Lynn, Mass.,

November 4, 1882. Mr. E. S. Bowler writes me that he obtained one taken in Penobscot county, Maine, January 15, 1882, and two taken in the same county January 23, 1883. Two were taken near St. John, N. B., and sent to that city February 17, 1882. Mr. C. A. Creighton has informed me of one taken at Waldoboro', Me., in January, 1881. And I am indebted to Mr. Ralph Miller, of Portland, Me., for a specimen taken by him alive, by hand, in this city, March 3, 1883.—*Everett Smith, in Forest and Stream.*

WHITE BEAVERS.—When at Olympia, Washington Territory, in June, 1882, my attention was called to a mounted specimen of a beaver, an albino, belonging to Mr. E. T. Young, of that place. It was clearly and absolutely white throughout, without the least tint of the usual color, and in fine condition. I learned from the owner that it was killed at or near Goldsborough, head of Big Skookum bay, Mason county, about twenty-two miles from Olympia. Another albino specimen of these animals is owned by a neighbor of Mr. Young. It is not, however, in as fine condition, or of as clear a white, but shows a tinge of the ordinary color, although a decided albino.—*R. E. C. Stearns, in Cultivator's Guide.*

ZOOLOGICAL NOTES.—*Protozoans.*—Gigantic specimens of *Actinosphærium eichhornii* have been noticed by Professor Leidy in an aquarium; they measured $\frac{3}{4}$–1^{mm} in diameter, independent of the rays, which extended from $\frac{1}{4}$–$\frac{1}{2}^{mm}$ more. One of the smaller individuals contained four water-fleas (Daphnia), and one of the larger six of them.

Worms.—Dr. J. Jullien (Bulletin de la Société Zoologique, 1882) gives descriptions of the Bryozoa dredged by the *Travailleur* in the Atlantic in 1881. About forty-three species are enumerated, all except three of which are new. Two of these (*Discoporella clypeiformis* Smitt, and *Scrupocellaria pusilla* Smitt) are found in Florida, while *Setosella vulnerata*, previously known only from Shetland, was found in the Bay of Biscay and in the Mediterranean.——M. G. Carlet's studies of the bite of the leech prove that the denticles of the jaws of this creature are not strong enough to let blood by a single act, but work through the skin by many scarifications in the same spot.

Mollusks.—The resistance of various mollusks to the effects of water containing only one or an excess of one of the constituents of normal sea-water, has been the subject of some interesting experiments by M. H. A. Coutance. The experimenter prepared eight solutions containing one ingredient only, and three in which chloride of magnesia, chloride of potash and sulphate of magnesia respectively predominated instead of chloride of sodium. The mollusks experimented upon were *Venus reticulata*, *Mytilus edulis*, *Venus decussata*, *Littorina vulgaris* and *Tritonium*

undatum. The facts observed were, that every change in the constitution of sea water is, in the long run, fatal, but that there is great difference in the rate of the toxic action of any one solution upon the same animal, and great range in the resistance of different mollusks to the same solution. The gasteropods succumbed before the bivalves, yet Littorina, defended by its operculum, resisted longer than the non-operculate and canaliculated Tritonium. The mussel died before either of the Veneridæ, and *V. decussata* showed a vitality far surpassing any of the others. The salts of soda and magnesia were far less fatal than those of potash, and also sustained life longer than chloride of sodium alone, but in the latter they extended their siphons a much larger portion of the time than in sulphate of magnesia or sulphate of soda. Death in the case of the bivalves arrived from muscular enfeeblement, at last resulting in inability to close the valves.

Crustaceans.—In the Transactions of the New Zealand Institute, C. Chilton describes upwards of twenty new species of Crustacea, principally belonging to the Tetradecapoda, but including two Brachyures, *Hymenicus marmoratus* and *Hymenosoma lacustris.* Among the species are several obtained from a well sixteen feet deep, one of which, the isopods *Crunegius fontanus* and *Phreatoicus typicus*, are without eyes. This well and those near it are sunk in a bed of gravel, in the interstices of which it would appear that the Crustacea reside. *Apseudes timaruria* is a very peculiar form, combining Isopodan and Amphipodan characters, having the head united with the thorax into a carapace, and possessing gnathopods that recall the chelæ of a Macruran. The same author enters into a detailed comparison between the English crayfish and *Paranephrops setosus.*

Arachnids.—Mr. C. Chilton, in the Transactions of the New Zealand Institute, describes a sea-mite which he places in the genus Halacarus Gosse, two species of which have been previously described from England.

Fishes.—Dr. Gill, in a note upon the relationships of the Echeneidids (Proc. U. S. Nat. Mus., 1883) gives the views of previous naturalists on their affinities, but states as the result of his own examination, that (1) the ventrals have true spines, and thus would be Acanthopterygians of Cuvier; (2) the "basis cranii" is simple, and there is no "tube." Thus these fishes are not at all near to the Scombridæ and Carangidæ with which they have usually been ranged, nor can they be placed in Cope's sub-order Distegi. Dr. Gill finally creates for them the sub-order Discocephali. He also approximates the Ephippiids to the Chætodonts, and Lobotes to the Serranidæ.——In a note upon the Hyperotreta the same naturalist distinguishes the families Bdellostomidæ with the genera Polistrotrema (with ten or eleven pairs of branchiæ), Heptatrema (with six or seven pairs) and Myxinidæ

with the single genus Myxine. In the Hyperoartia or Petromyzontidæ he recognizes the genera Petromyzon, Ichthyomyzon, Ammocœtes, Entrophenus, Geotria, Exomegas and Caragola. The form of the suproval laminæ is the principal character made use of, and Caragola, which has two such laminæ, is made the type of a sub-family.

PHYSIOLOGY.[1]

STUDY OF THE PHYSIOLOGY OF THE KIDNEY BY MEASUREMENTS OF ITS CHANGE OF VOLUME.—Dr. Roy has employed an ingenious instrument, the *oncometer*, devised by him on the principle of the *plethysmograph*, for the measurement of variations in the volume of the kidney. The apparatus consists essentially of a metallic box lined with a flexible membrane, in which the kidney of a living animal while in its normal situation can be laid and inclosed in an air-tight manner. The space between the kidney and the box is filled with warm oil which finds its exit by means of a tube terminating in an ingenious device furnished with a registering lever. With every increase in size of the kidney, a certain amount of oil must be forced out of the metal box and go to raise the lever of the registering apparatus; conversely, when the kidney diminishes in volume the lever falls, because the oil flows back into the kidney-box. The movements of the lever were recorded upon traveling paper. Living, narcotized cats, dogs and rabbits were experimented upon, and the operation, though apparently so severe, did not seem to interfere with the physiological action of the kidney, for the organ which was inclosed in the box secreted as abundantly as its fellow which remained in its natural surroundings.

The results of the experiments showed that the lever of the oncometer traced a curve which ran parallel to the general blood pressure curve as obtained from the femoral artery. Beside these slight changes of volume, due to heart beat and respiration, the two kidneys undergo slow, rhythmic but not simultaneous alternate increase and decrease of size. During the progress of an experiment a sudden shock to the animal or an insufficient supply of air would cause the general blood pressure to rise, but a diminution in the kidney-volume, showing a great constriction of the renal arteries and consequent scant amount of blood in the kidney. This vaso-motor constriction of the kidney arteries is due to a reflex action, for if the nerves entering the kidneys are severed in the hilus the volume of the kidney increases with the general rise of blood pressure which accompanies dyspnœa, as would follow on common hydraulic principles. Division of the splanchnic nerves, however, does not completely do away with the reflex. It is very difficult to manipulate the nerves entering the kidney, for some of the branches are intimately con-

[1] This department is edited by Professor HENRY SEWALL, of Ann Arbor, Michigan.

nected with the walls of the renal vessels. Stimulation of the proximal end of the divided sciatic nerve is accompanied by a rise of general blood pressure but by a fall in the volume of the kidney; which change, as in the previous case, is due to a vaso-motor reflex. The same results follow poisoning by strychnia. When the splanchnics are cut at the level of the diaphragm there is a slight momentary decrease in the volume of the kidney, and then a return to the normal. When the central or anterior end of a divided splanchnic is irritated, the volume of the kidney is diminished on both sides, showing a reflex vaso-motor constriction. Essentially the same effect follows when the peripheral ends of the divided splanchnics are stimulated. Vaso-motor fibers for both kidneys may run in the splanchnic of one side, but individuals differ in the extent to which this appears to occur. Vaso-motor fibers proceed to the kidney by paths other than the splanchnic nerves.

Complete or partial closure of one renal artery, during the course of an experiment, has no influence upon the blood current or the volume of the other kidney, nor does stopping the circulation in large extra-renal arteries, as those of the limbs, cause any change in the volume of the kidneys. The volume of the kidney was likewise quite uninfluenced when a dog under observation was surrounded alternately with ice-cold water and water heated to the body temperature.

The Action of Ethyl Alcohol upon the Dog's Heart.—Professor Martin, with the assistance of a pupil, Mr. Stevens, has entered the debating ground of alcohol-physiology with some new and definite and therefore welcome statements of facts in regard to this subject. In the experiments of these gentlemen, the living but completely isolated dog's heart was supplied from a flask with an artificial current of warm blood, to which any chosen percentage of pure alcohol might be added. The authors sum up their results as follows: "When defibrinated blood containing ½ of one per cent by volume of ethyl alcohol is supplied to an isolated dog's heart which had been hitherto working with uniformity, the invariable result is a very rapid and marked diminution in the work done (indicated by the quantity of blood pumped out from the left ventricle) by the heart in a given time. When the blood contains only ¼ of one per cent of alcohol, the result is, in most cases, the same, but sometimes is little or none. After the action of the alcohol has been fully manifested, the heart can, in many cases, be restored to its original working state if supplied with defibrinated blood containing no alcohol." It was noticed that the heart became more and more gorged, under the action of the alcohol, with increasing relaxation in diastole and decreasing extent of contraction in systole, until the resistance offered by the pericardium prevented farther increase of size in the heart cavities, and as the extent to which these were nar-

rowed in systole became gradually less, the amount of blood pumped out diminished proportionately. If the pericardium was now cut away the heart began immediately to pump out more blood, because its cavities expanded under the pressure upon them in diastole, while the extent to which they were constricted in systole remained the same. "The action of alcohol administered in the manner and doses above described is, without primarily altering the force of the heart beat, to alter its character, so that the ventricular cavity is not obliterated at the end of the systole, and the less so the longer the alcohol has been administered. At first this incomplete systole is compensated for by a more extensive diastole, so that the difference between the capacity of the ventricle in complete diastole and that in complete systole remains the same as when the organ was normally beating. Consequently the quantity of blood pumped out at each beat remains the same as before. If the heart be confined in the pericardium it soon, however, ceases to have room to swell during diastole to a size sufficient to compensate for its incomplete systole; and thenceforth, as the swelling increases the difference between diastolic and systolic capacity becomes less and less. As the necessary result, the quantity of blood pumped round by the organ is proportionately diminished. Removal of the pericardium prevents this result, at least for a considerable time." These experiments, and also careful observations on a human subject, failed to show any alteration of pulse rate due to alcohol.

Relation of Arterial Pressure to the Duration of the Systole and Diastole of the Heart-beat.—The study of the mammalian heart, as isolated by the Baltimore method, has been continued by Howell and Ely in determining whether the amount of arterial pressure, *i. e.*, the resistance which the ventricles must labor to overcome, has any relation to the duration of the various phases of the heart-beat, it having been previously determined that the number of complete beats in a given time was unaltered by very extensive variations of arterial pressure. In the experiments under consideration arterial pressure was varied by altering the height of the blood-outflow tube which communicated with the aorta. A slender rigid tube with a terminal and a side opening was passed through the superior vena cava and right auricle into the right ventricle. The two cavities of the heart were thus made continuous with that of the tube through the opening in the latter. The tube being filled with defibrinated blood was connected at its external extremity with an accurate registering instrument, by means of which changes of pressure within the heart cavities could be plainly recorded. Experiments performed in this manner show that variations of arterial pressure, at least within a range so extensive as that included between 50 and 160 mms. Hg., have no influence whatever upon the duration of either the systole or diastole of the heart-beat in the dog.

PSYCHOLOGY.

INTELLIGENCE OF THE HORSE.—As bearing on the question of the intelligence of animals, I send the following note for publication at the request of Dr. Packard:

A few years ago Mr. Eli Rigby, living at Stillwater, a small village a mile from here, turned his span of farm horses out loose on the road, when, without his knowledge, one of them went to the blacksmith shop of Mr. John Gould, who had been accustomed to shoe this span. Finding the door of the shop open, the horse entered and lifted up one foot in such a manner as to attract attention. The blacksmith, supposing the owner to be near by, examined the foot and found the shoe broken in such a way as to hurt the horse when he walked, and he therefore put on a new shoe, after which the horse went off home of his own accord. Later in the day the blacksmith saw Rigby and asked him if he had got his horse all right, which led to explanations, when it appeared that Rigby not only did not know that the horse had been to the shop, but he did not even know that there had been any trouble with his shoe.

Both Gould and Rigby are thoroughly reliable men, and I had this account directly from them.—*C. H. Fernald, State College, Orono, Me.*

EXHIBITION OF THE SAME INTELLIGENCE IN AN OX.—Of a yoke of oxen which had belonged to the Cape Ann Granite Company, one had become too lame for further usefulness, and in consideration of past faithful services was turned out to grass.

A few days since he was seen limping toward the blacksmith's shop, where he had been often shod, and making his way into the shop he took his place in the shoeing frame and held up a foot to the smith, who watched his singular movements. The blacksmith examined the foot and discovered that a small stone had got crowded under the shoe and pressed on the foot in a way to produce the lameness. The stone was removed and the animal sent away, no doubt rejoicing in his ox heart that there was at least one man who could understand ox language sufficiently to relieve suffering.—*Cape Ann Advertiser.*

ADOPTION BY A CAT OF FIVE YOUNG RATS.—Apropos of the facts stated by Judge Caton bearing on singular friendships between animals usually indifferent or hostile to each other, we quote the following instance related by P. Dudgeon in *Nature*: "A Mr. Maxwell owned a cat which had a litter of five kittens; *three* were taken from her and drowned: the following morning it was found she had brought in *three* young rats, which she suckled with the two kittens that had been left. A few days afterwards the *two* kittens were destroyed, and the next morning it was found the cat had brought in *two* more young rats. While we were looking at this strange foster family the cat came into

the stable, jumped over the board and lay down, when the rats at once ran under her and commenced sucking. What makes the matter more singular is, the coachman told me the cat was a particularly good ratter, and was kept in the stable for the purpose of keeping down rats."

ANTHROPOLOGY.[1]

THE ARCHÆOLOGICAL INSTITUTE.—The fourth annual report of the executive committee, just issued, has its cheering and its gloomy side. Three separate narratives are included in the same pamphlet. 1. Mr. Bandelier has continued his researches in New Mexico, steadily increasing the sum of knowledge concerning the number, the distribution and the local peculiarities of the ancient Pueblos, and gradually accumulating the information upon which conclusions with respect to the mutual relations and the migrations of the various branches of the native stock, as well as the limits of their civilization may be safely based. His official letters containing the summary report of his work will be printed in the forthcoming bulletin, No. II. Now the gloomy fact, with reference to this part of the pamphlet, is, that the printing of Mr. Bandelier's last report had to be suspended for the want of five hundred dollars. If some of our wealthy friends who are spending large sums in giving a fictitious value to stone implements and thereby endowing fraud, would come to the aid of this most worthy enterprise, they would add greatly to the debt of gratitude which posterity will owe this generation. 2. The expedition to the old Greek city of Assos, organized and supported by the Archæological Institute, is the first contribution of America to the world's knowledge of classic civilization. The remains now visible give a clearer view of the life of an ancient city than even Pompeii itself. The site of the ancient Assos, on the south coast of the Troad, is one of the most magnificent in all the Greek lands. From the very edge of the waves, where the strait between Lesbos and the Troad is narrowest, an isolated rock springs to a height of more than 750 feet, and high up on the brow of this trachyte cone, the Greek town of Assos arose, with its colonnades, baths, theater, its broad public walks and its monuments of the dead, mounting tier above tier, till the very summit of the crag was crowned with a doric temple of Athene. 3. The third portion of the report relates to an American school of classical studies at Athens, supported by the coöperation of colleges in our country. This institution has passed through the critical period of its first year, and gives every evidence of a permanent success.

THE CHARNAY COLLECTION.—The Lorillard expedition to Mexico and Central America has produced its fruit. According to

[1] Edited by Professor OTIS T. MASON, 1305 Q street, N. W., Washington, D. C.

the agreement made with M. Charnay, under the patronage and superintendency of Mr. Thorndyke Rice, the French government was to have the first set of casts and the National Museum the second. The series for our country have arrived and are now being set up in a large room appropriated to them in the National Museum. There are two groups, one from Palenque, the other from Chichen-Itza, and a few pieces from Ocosingo, Tezcoco, &c. The Palenque groups are: 1. Bas-reliefs from the temple of Inscriptions, twelve pieces; 2. The bas-reliefs constituting the "altar" in the temple of the Sun, five pieces (Dr. Rau thinks Charnay wrong, and that two of these belong to the next group); 3. The celebrated group of the cross, three pieces (five according to Dr. Rau); 4. Bas-reliefs, katunes, sculptures, columns, &c., eighteen pieces; 5. Bas-reliefs from Chichen-Itza, thirty-five pieces, among which are the materials for two groups, one constituting a sculptured dado of great interest, the other forming an immense wall and inclined ceiling. These casts are made in a composition of plaster and tow, which give them great lightness and strength. A careful scrutiny of these slabs, one after another and from day to day, excites reflections concerning their fabricators and their civilization. No doubt the truth lies between the two extremes of modern interpretation. The Spaniards destroyed a well advanced civilization, something like the old Chaldean, but not one superior to their own. On the other hand, many evidences of survival obtrude themselves pointing to a savage origin and communal dwellings; but between the men who lived and wrought at Palenque and Chichen-Itza and our roving savages were many milestones of progress. A writer in *Science* drew attention to a discovery of Professor Cyrus Thomas to the effect that the French commission, consisting of MM. Mérimée, Augrand, Longperier, Aubin, De Saint-Priest and Daly, appointed in 1860 to edit Waldeck's drawing, took Catherwood's drawing of the group of the cross, reproducing all his errors. This is correct. Waldeck saw the slab in place, no doubt, and Catherwood did not. But Charnay's casts fulfill Dr. Thomas's predictions by exhibiting the glyphs which he said ought to be there, in spite of the drawings of both Catherwood and the "Monuments anciens du Mexique."

Revue d'Ethnographie.—This journal, under the direction of Dr. Hamy, has passed safely through its first year, and enters with its present number upon the second volume. The original papers are as follows:

Corre, Dr. A.—The Sérères de Joal et de Portudal, on the west coast of Africa, pp. 1–20, ill.

Tarry, M. H.—Excursion Archéologique dans la vallée de l'Oued Mya, near Ouargla, in the Desert of Sahara, on the borders of Southern Algeria, pp. 21–34.

Bertrand, Alex.—Les Troglodytes, ill., pp. 35–64.

Charnay, Désiré—Exploration des Ruines d'Aké, Yucatan, pp. 65–74.

Riedel, J. C. F.—Le Ponor, ou l'ordre de la Jarretéere a Timor, pp. 75–76.

Hamy. E.—Review of J. Harmand's "Les races Indo-chinoises," Hervey's "The Endau and its tributaries," and Youferow's "Voyage dans le Carélie et dans la region de l'Onega."

ANTHROPOLOGY IN FRANCE.—The fasciculi 3 and 4 of the Bulletins de la Société d'Anthropologie de Paris contain the following papers of general interest:

Discussions sur le poids comparé du cerveau chez les garçons et chez les filles [refers to meetings of Feb. 2 and 16, and March 2], pp. 524–531.

Recherches expérimentales sur les trépanations préhistoriques, by L. Capitan, pp. 535–538.

Note sur les poumons des ourang-outangs. by M. Chudzinski, pp. 554–558.

Discussion sur l'ethnographie [criticisms upon the proposed "Questionnaire de sociologie et d'ethnographie"], pp. 557–578, 679–681.

Cours de l'Ecole d'Anthropologie pour l'anne 1882–1883. Sur les Galébis du Jardin d'Acclimation, by M. L. Manouvrier, pp. 602–643; 649–654; 662–671; 683–685; 796–

La Croix de Teotihuacan, by E. F. Hamy, pp. 654–657.

Le boudhisme à Ceylan, by M. Deloncle, pp. 658–661.

Sur les tribus qui habitent la Terre de Feu, by M. Olivier Beauregard, pp. 672–674.

De l'origine des Dardous [a tribe in Cashmire], by M. Girard de Rialle, pp. 674–679.

Discussion sur les types Kabyles, pp. 685–688, 888–897.

Quelques observations sur l'Anthropologie des Comalis [Soumalies], by E. T. Hamy, pp. 697–706.

L'Instinct Social, Mme. Clémence Royer, pp. 707–737.

L'Amérique préhistorique, by M. de Nadaillac, pp. 733–752.

Les Chevaux dans les temps préhistorique et historiques, by M. Piétrement, pp. 752–757.

Remarks à propos du denombrement de la population sur quelques differences démographiques présentées par les catholiques, les protestants, et les israelites, by Gustave Lagneau, pp. 757-760.

Recherches craniologiques sur une série de crànes d'assassins, by M. Orchanski, pp. 764-789.

Photographies de Criminels, by M. Bordier, pp. 795-796.

En Asie, Kachmir et Thibet, Etudes d'ethnographie ancienne et moderne, by Olivier Beauregard, pp. 820-879.

Les mutilations dentaires au Mexique et dans le Yucatan, by E. T. Hamy, pp. 879-887.

Sur la vision binoculaire, by M. Rabourdin, pp. 897-899.

It would consume too much space to present an abstract of each of these papers, but some of them are of very great general interest to those who are pursuing special topics.

THE AMERICAN ANTIQUARIAN SOCIETY.—Mr. Nathaniel Paine has prepared a complete list of the publications of this honored association, founded in 1812. The catalogue commences with the Archæologia Americana:

Vol. I, published in 1820, contains the descriptions of Hennepin, Atwater, Fiske, Alden, Mitchell, Farnham, Willkins and Sheldon.

Vol. II, published in 1836, gives the treatises of Gallatin, Gookin, De Witt Clinton, Galindo and Clarke.

Vols. III–IV contain no anthropology.

Proceedings, October 22, 1855. Samuel O. Haven on American archæology.

Proceedings, October 20, 1866. On the establishment of a museum and professorship of archæology and ethnology at Harvard Univ. by George Peabody.

Proceedings, April 23, 1872. Admixture of Japanese blood on our north-west coast, by Horace Davis.

Proceedings, October 21, 1873. Origin, &c., of Indian missions in N. England, and a list of books in the Indian language, &c., by J. H. Trumbull.

Proceedings, April 26, 1876. Remarks on Yucatan and the Mayas, by Stephen Salisbury, Jr.

Proceedings, April 25, 1877. The copper age in Wisconsin, by James D. Butler; The Davenport Tablets, by Farquharson; Discoveries in Japan, by Le Plongeon.

Proceedings, April 24, 1878. Terra-cotta figure from Isla Mujeres, by Stephen Salisbury; The Mexican calendar stone, by Ph. J. J. Valentini.

Proceedings, October 21, 1878. Archæology of Yucatan, by Dr. and Mrs. Le Plongeon.

Proceedings, April 30, 1879. Mexican copper tools, by Ph. J. J. Valentini; Letter from M. Le Plongeon.

Proceedings, October 21, 1879. The Katunes of Maya history, by Ph. J. J. Valentini.

Proceedings, April 28, 1880. The Landa alphabet, by Ph. J. J. Valentini.

Proceedings, October 21, 1880. Mexican paper: an article of tribute, by Ph. J. J. Valentini; Bibliography of Yucatan and Cent. America, by Ad. F. Bandelier.

Proceedings, April 27, 1881. Coronado's discovery of the seven cities, by E. E. Hale; Mayapan and Maya inscriptions, by Augustus Le Plongeon; Two Mexican Chalchihultes, by Ph. J. J. Valentini.

Proceedings, October 21, 1881. The seven cities of Cibola, by H. W. Haynes.

Proceedings April 26, 1882. Perforated Indian humerus, by H. W. Haynes; Notes on Mitla, by Louis H. Aymé.

Proceedings, October 21, 1882. The Olmecas and the Toltecas, by Ph. J. J. Valentini; Copper implements from Mexico, by F. W. Putnam.

The paper by M. Aymé and the following one by Mr. Valentini, have not hitherto been noticed in the NATURALIST. The description of Mitla, by Burgoa, is given by Mr. Salisbury in an English translation, and M. Aymé completes the description with a series of measurements very elaborate indeed. Mr. Valentini's discussion of the Olmecs and Toltecs is very much in his usual vein of going cautiously or not at all. The author is not sanguine about the decipherment of the Maya.

HITTITES IN AMERICA.—Professor John Campbell, of Montreal, having in preparation a volume on the history of the Hittites, their migrations, antiquities, and language, has published a pamphlet of sixteen pages as an *avant courier*. The peculiar point to which we would draw attention is the certainty of the author that he has discovered genuine and convincing evidences of relationship between these Hittites and the Basques, Yeniseians, Yukahirs, Coreans, Japanese, Mound-builders, and Aztecs. A word will show Professor Campbell's method: "Convinced of the Hittite origin of the Aztecs, an origin to which their own traditions testify, I give to the characters of Hamath, resembling those of Mexico, the Aztec phonetic values. The justice of the process was verified by comparisons with the Corean and Cypriote alphabets, and also the old Hebrew and Phœnician," &c. With

this key Professor Campbell proceeds to read the inscriptions. It is too soon to say a word about the merit of this work, and we shall wait with considerable impatience for the volume, explaining more thoroughly the method.

MICROSCOPY.[1]

THOMA'S SLIDING MICROTOME, IMBEDDING METHODS *(Continued from p. 998)*.—Professor Thoma adds to his description of his microtome some remarks on the imbedding methods more generally used. The method of treating tissues with gum arabic, first brought into use by Rindfleisch and Ranvier, is now very generally known and practiced. The same may be said of the method of cutting sections between two pieces of elder pith or hardened liver, &c. These in certain conditions are very useful and simple, but other methods of imbedding of more recent date give sections of the utmost perfection and unsurpassed delicacy.

The method of imbedding in emulsions containing fat and albumen originated with Bunge, and was subsequently modified by Calberla and Ruge. The following is very nearly the formula of the latter: The albumen and yelk of several hen's eggs is placed in a porcelain mortar and well stirred until it forms a thin yellow fluid, a result generally obtained in a few minutes. This fluid is subsequently passed through thin linen in order to remove the remaining membranaceous fragments. The specimen previously hardened in alcohol is then fixed by pins in a paper box and covered with the fluid. The preparation cannot, however, be immersed directly in alcohol for the purpose of hardening. It must be first hardened by alcohol steam, taking care never to raise the temperature of the steam above 30° C. For this purpose Professor Thoma uses a simple apparatus represented in Fig. 6.

A shallow water-bath, *a*, stands on an iron tripod, *b b b*, and is heated by a small flame, *c*. The water-bath is covered by a thin plate, *d d*. Upon this plate is a small glass vessel, *e*, filled with common alcohol and covered with a perforated disk of tin, *f f*. On this disk are placed the paper boxes, *g g*, containing the specimens and the imbedding fluid. The latter and the alcohol vessel are again separated from the external air by a glass cover, *h*. This apparatus, slightly heated, will harden the imbedding masses within a few days, after which time they are removed and subsequently fully hardened in a bottle

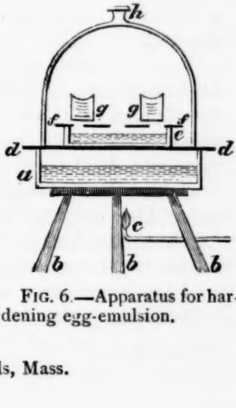

FIG. 6.—Apparatus for hardening egg-emulsion.

[1] Edited by Dr. C. O. WHITMAN, Newton Highlands, Mass.

containing ordinary alcohol. The latter process determines the degree of consistence of the imbedding mass. It can be made extremely hard by repeated use of strong alcohol. After a few trials it will be easy to find the convenient degree of consistence for each specimen.

If the temperature of the alcohol steam is more elevated, it will be found that the imbedding mass, instead of shrinking, will appear to increase in volume, innumerable air-bubbles developing in the emulsion. This can be easily avoided by using lower temperatures. Another danger, however, exists in the holes which the pins make in the walls of the paper boxes. The emulsion, before hardening, is so very liquid that it will pass through the smallest opening; this renders it necessary not to withdraw any of the pins from the sides of the paper box, and to use boxes without any openings. It will be found that this mass adapts itself perfectly to all surfaces of the specimens without penetrating into their interior structure, and that it can be cut admirably at all thicknesses down to $0.003^{mm.}$ Another very agreeable quality results from the fact that the newly prepared emulsion will adapt itself readily to hardened pieces. This enables us to spread out fine membranes on pieces of the hardened imbedding mass, and subsequently to imbed both in the way just described.

After this praise of the egg-emulsion, it will be just to mention a property which is occasionally disagreeable. It cannot be easily detached from the sections, and we have no means of dissolving it in media which do not injure the objects. The mass also colors in all the staining fluids generally used, and therefore becomes very visible in the preparations. The latter inconvenience should in all cases be avoided by coloring the specimen *in toto* before imbedding. For this purpose the fluids of Grenacher,[1] and especially alum-carmine, may be recommended. The imbedding mass remains nearly absolutely colorless if the specimen, after staining and before imbedding, is hardened again in alcohol.

Very elegant results may also be obtained by an imbedding mass originally invented by Duval and recently much improved by Merkel and Schiefferdecker.[2] This is collodion, or, preferably, a solution of so-called *celloidin.* If this substance cannot in general be cut to such extreme delicacy as the albuminous mass just described, it has a great advantage in being extremely pellucid. The original communication of the last-named author is easily accessible, so that Professor Thoma considers it is superfluous to give a detailed account of it, but adds a few remarks on his own experience with it.

According to the formula of Schiefferdecker, the imbedding

[1] Arch. f. Mikr. Anat., XVI (1879), p. 465.
[2] Arch. f. Anat. u. Physiol. (Anat. Abtheil.), 1882.

fluid consists of a concentrated solution of celloidin in a mixture of equal parts of absolute alcohol and ether. The specimen is soaked successively in absolute alcohol and ether, and in the imbedding fluid. This requires at least several days. After this time the imbedding proper may be undertaken, and for this we have the choice of two methods.

The even surface of a cork is covered with a thick solution of celloidin, so as to form, by evaporation, a strong collodion membrane on the cork. Upon this is put the specimen, covered layer by layer with fresh quantities of the solution of celloidin, each being allowed to dry only partially. When the object is thoroughly covered we immerse it in alcohol of 0.842 sp. gr. In twenty-four hours the whole is ready for cutting.

The other method makes use of little paper boxes for the imbedding. The specimen, soaked in celloidin solution, is fixed in the box by pins, and the box filled with celloidin. The preparation is then placed on a flat piece of glass and covered with a glass cover which does not exactly fit the glass plate. In a few days the ether will have evaporated gently and slowly from the imbedding mass, and the latter will shrink a little. If necessary further celloidin solution can be poured in the paper box to fill it again. It is only necessary to moisten the surface of the first mass with a drop of ether in order to allow of a perfect junction between the old and the new layers. The preparation is again exposed to slow evaporation below the glass cover, and a few days later the imbedding mass will be consolidated to an opaline body, whose consistency can well be compared to that of the albumen of a boiled egg. The walls of the paper box can now be removed, and the imbedding mass placed in very dilute alcohol, which will, in a very few days, produce a proper degree of consistency to admit of cutting.

This method differs in some degree from that which Schiefferdecker gives for imbedding in paper boxes. As other observers have remarked, his method frequently gives rise to a great number of air-bubbles in the imbedding mass. Consequent upon the altered manipulations of Professor Thoma, we have to adapt the imbedded specimen to a cork for the purpose of cutting. This may be done in the following way: The even surface of the cork is covered by a thick layer of celloidin solution. This is allowed to dry up perfectly, so as to produce a hard membrane of celloidin. This is again covered with further celloidin solution. In the meantime the lower surface of the imbedding mass is cut even and washed with absolute alcohol, and subsequently moistened with a drop of ether. This moist surface is adapted to the stratum of liquid celloidin on the cork, and exposed for a few minutes to the open air. After this the whole is placed in dilute alcohol, which in a few hours will unite the imbedding-mass solidly with the cork.

In a great number of cases it may be regarded as a great advantage of the celloidin that it penetrates the tissues thoroughly and yet remains pellucid, so as to be more or less invisible in the specimen. This quality can be made use of in another direction for the purpose of soaking specimens which are too brittle to be cut after hardening alone. We may make use of celloidin in a similar way to the gum arabic mentioned above. The minute normal and pathological anatomy of the lung in particular will derive great advantage from such a proceeding. Indeed, we are not able to get a perfect idea of the changes produced by pneumonia if we do not by this method or by the following (with paraffine) prevent the loss of a great part of the exuded substances which in this disease lie loose in the alveolar cavities. The study also of micro-organisms in the lung will derive great benefit from the celloidin method, and it will be very welcome to many to know that the tissues imbedded in celloidin may be stained with the different fluids, ammonium-carmine, alum-carmine, borax-carmine, hæmatoxylin, analine colors and various others. The reaction of acids and alkalies, particularly acetic acid and solution of potash is, moreover, not interfered with. And further, we are able to color the object before imbedding with all staining fluids which are not soluble, or only little soluble, in alcohol and ether.

After staining and cutting the sections may be mounted in glycerine and various other fluids. Mounting in Canada balsam requires, however, some precautions on account of the chemical character of the celloidin. Absolute alcohol and oil of cloves should be avoided and replaced by alcohol of ninety-six per cent, and by oleum origani. This is, at least the advice of Schiefferdecker and Professor Thoma has had no occasion to be dissatisfied with the result.

The efforts of Bütschli and Blochmann[1] have given us another splendid-imbedding mass,[2] paraffine dissolved in chloroform, which admits of sections of the highest delicacy. Bütschli was able to cut, in this imbedding substance, small specimens down to $0.002^{\mathrm{mm.}}$ This method seems particularly adapted to researches in embryology and zoölogy where hitherto imbedding masses formed of paraffine and turpentine have been frequently used.

Usually it appears advisable to stain the specimens *in toto* before imbedding in paraffine and chloroform, and for this purpose Grenacher's alum-carmine and borax-carmine are very highly to be recommended. The long-known ammonium-carmine is also occasionally useful.

Dr. M. Schulgin,[3] in order to obviate the inconvenience that the same portion of the knife has always to be used, has had a

[1] Biol. Centralbl., I (1881), pp. 591-2. See this journal, II (1882), p. 708.
[2] The credit of introducing this mass belongs to Dr. Giesbrecht.
[3] Zool. Anzeig., VI (1883), p. 21.

knife of a somewhat different construction made (but which he does not explain). The advantage of this is that it can be moved along its whole length, so that different portions can be used for cutting.

Professor R. Kossmann writes:[1] "Many to whom the turning back of the micrometer-screw of the microtome is an annoying delay, will be thankful to me for pointing out to them that in two or three seconds it can be turned back its whole length by using a kind of fiddlebow, such as is used for drilling holes. The loop of the bow-string (made of strong silk cord, waxed or rosined) is passed round the smooth neck of the screw, and the bow is moved alternately to the left with stretched, and to the right with slackened cord."—*Journ. Roy. Microscopical Society, iii, 298.*

——:o:——

SCIENTIFIC NEWS.

— The new antiseptic, boro-glyceride, may furnish us with another preservative. From an utter absence of smell, taste (except a slightly sweet one) and innocuous qualities, it has been suggested that fresh fish preserved by it may be sent long distances in good condition. The boro-glyceride should be mixed with many times its bulk of warm water, and cloths wet with the solution should be put in and wrapped around the eviscerated fish. This is certainly a good field for experiment.—*Scientific and Literary Gossip.*

— Mr. John Young, at a recent meeting of the Glasgow Natural History Society, gave some interesting facts in connection with *Callianassa turneriana*, a macrurous crustacean found on the west coast of Africa. It is said to occur periodically once in four or seven years in large numbers. "With the natives of the Cameroons it forms part of the dowry of a woman at marriage, and should divorce be necessary, the shrimp must also be returned; but not being always obtainable, there is room enough for a good African quarrel among the natives." — *Scientific and Literary Gossip.*

——:o:——

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

American Association for the Advancement of Science, Minneapolis, Aug. 15-21, 1883.—The attendance on the meeting was rather small, but 300 members participating.

Professor Hunt, of Montreal, for the committee on international congress of geologists, reported that it had held a meeting and had considered two subjects—uniform geological nomenclature and geological cartography. On the first subject it was reported that the committee had conferred with Maj. Powell, director of

[1] Ibid.

the United States Geological Survey, and that he had kindly assisted them, and would furnish geological maps of the United States colored after his own very good system. This was the system which would probably be adopted. On the subject of a common geological nomenclature, the committee reported that it was collecting a mass of suggestions from geologists all over the country, and in a few weeks hoped to be able to send a comprehensive report to the geological congress soon to meet in Berlin.

For the committee appointed to confer with foreign associations with reference to international associations, Professor T. S. Hunt, of Montreal, reported that he had had correspondence with the officials of the British Association for the Advancement of Science. As a result, it had been arranged that that association would hold its next meeting in Montreal at about the same time as the next meeting of this association, and that members of each association would visit the other. The report was accepted and the committee continued to complete the arrangements.

The committee on the exchange of courtesies with foreign associations, consisting of Professors Young, Morse, Mendenhall, Dawson and Hunt, reported in favor of meeting next year in Philadelphia, Sept. 3, in order to accommodate the members of the British Scientific Association, which will meet in Montreal about the same time. The report, with the exception of the date, was accepted and the committee continued, to make arrangements for fraternal intercourse between the associations.

The committee on the question of duty on imported scientific text-books reported that this was a matter for careful consideration, that science belongs to no one country, but is cosmopolitan, and that there ought to be the freest interchange of scientific works between the different countries; that the present arrangement of allowing colleges only to import scientific text-books free is not comprehensive enough, and that the same privilege ought to be extended to students also; that the present standard of scientific text-books in this country is very low, and needs foreign influence to bring it up to the modern standard; that there are published in the United States no abstract technical text-books nor any devoted to pure science, none in foreign languages; that some action should be taken on the matter, but that the committee was not yet prepared to suggest what this action should be. For further consideration of this subject the committee recommended the appointment of a committee of the association, including the president, to present the matter to Congress, and recommended as this committee, Professor Rowland, Gen. Cox, Maj. Powell and Professors Young and Morse, with power to add to their number.

The discussion of this report was introduced by Maj. Powell, who moved that the clause be stricken out which criticised American scientific text-books. He said that on a number of

scientific subjects, such as geology, botany and mathematics, there were text-books by American authors which were equal to any foreign works, and he thought the terms of the report too sweeping. He insisted that in many departments of science there were excellent American text-books. [Applause.]

Professor Mendenhall—I think that the statement of the report is true, except in exceptional cases. I take it that the report does not mean to cover these cases. I approve of the statement.

Maj. Powell—In several departments of a science I am acquainted with the American text-books are best. There are Dana's Geology and the Geology of Le Conte of California, and Gray's Botany, which, in my judgment, are unequaled; and so I might name many other good text-books. I have looked into this matter the more, perhaps, because I am a member of a committee on the introduction of science into the public schools, and my experience teaches me that these works which I have mentioned are not to be equaled elsewhere. [Applause.]

Professor Rowland—I agree with the statement of the committee as far as it relates to my own department of physics, and also to chemistry and mathematics. The statement in these cases is entirely true. We can only raise the standard of American scholarship in these departments by the introduction of foreign works. I know that some text-books on physics in American colleges are fifty years old. As a matter of policy it may be well to strike out the statement, but as a matter of fact the statement is true.

Gen. Cox suggested that the only matter reported for action by the committee was on the appointment of a committee to memorialize Congress, and that this discussion was not germain to that question, which was, "Shall we appoint a committee to memorialize Congress?"

Maj. Powell insisted that if the report of the committee was adopted it would be spread in full on the records as the mind of the association, and would commit the association to that extreme statement.

Dr. Gustave Heinrichs, of Iowa, moved as an amendment that Congress be asked to remit the duties on scientific instruments. As an illustration of how onerous this duty now is, he said that the best hygrometer now to be had is of foreign manufacture, the essential part of which is a human hair. This costs in Europe $9, and on it the Government collected a tax of $3, "which," said he "is pretty steep." [Laughter.]

Gen. Cox moved as a substitute that the recommendation of the committee be adopted, and the committee continued.

A member of the standing committee said that in the situation which the association now is, the relation of the American manufacturers, and public and political discussion of the tariff, makes this a vexed question, and that the committee felt that its recom-

mendation should be confined to the subject of text-books for the present. If the association could carry that point, it would then feel encouraged to agitate for free importations of instruments. For the present it was thought best to avoid the danger of political dispute. He moved to lay Dr. Heinrich's motion on the table.

Maj. Powell asked if this would not carry the whole question to the table.

The president ruled in the negative, and the motion was carried, as was also Gen. Cox's substitute.

After the reading in general session of an address on "The Evidence for Evolution found in the history of the extinct Mammalia," by Professor Cope, the association adjourned to meet in Philadelphia in 1884, at a date to correspond with the Montreal meeting of the British Association.

The following list of officers for the Philadelphia meeting, presented by the standing committee, was approved by the association:

President—J. P. Lesley, Philadelphia, Pa.

General secretary—Dr. Alfred Springer, Cincinnati, O.

Assistant general secretary—E. S. Holden, Madison, Wis.

Treasurer—William Lilly, Mauch Chunk, Pa.

Section A—President, H. T. Eddy, Cincinnati; secretary, G. W. Hough, Chicago.

Section B—President, John Trowbridge, Cambridge, Mass.; vice-president, N. D. C. Hodges, Salem, Mass.

Section C—President, John W. Langley, Ann Arbor, Mich.; vice-president, Robert B. Warden, North Bend, O.

Section D—President, R. H. Thurston, Hoboken, N. J.; secretary, J. B. Webb, Ithaca, N. Y.

Section E—President, N. H. Winchell, Minneapolis; secretary, Eugene A. Smith, Tuscaloosa, Ala.

Section F—President, E. D. Cope, Philadelphia; secretary, C. E. Bessey, Ames, Ia.

Section G—President, D. J. Wormley, Philadelphia, Pa.; secretary, H. Hitchcock, New York.

Section H—President, E. S. Morse, Salem, Mass.; secretary, W. H. Holmes, Washington, D. C.

Section I—President, John Eaton, Washington, D. C.; secretary, C. W. Smiley, Washington, D. C.

The following papers relating to the natural sciences were read:

SECTION E.

The comparative strength of Minnesota and New England Granites. N. H. Winchell.

On Rhizocarps in the Palæozoic period. J. W. Dawson.

On the microscopic structure of the test of fossil Brachiopoda. James Hall.

Clay pebbles, with an exhibition of specimens from Princetown, Minnesota. N. H. Winchell.

On glacial Cañons. W. J. McGee.

The life-history of the Niagara river. Julius Pohlman.
The singing beach of Manchester, Mass. H. C. Bolton and A. A. Julien.
The equivalent of the New York Waterlime group developed in Iowa. A. S. Tiffany.
The earth's orographic framework; its seismology and geology. Richard Owen.
Thermal Belts. J. W. Chickering, Jr.
On Rensselæria in the Hamilton group of Pennsylvania, and—
On a fossil Fish from the Hamilton group of Pennsylvania. E. W. Claypole.
A new Vertebrate from the St. Louis limestone. Wm. McAdams.
The "Continental Type," or normal orography and geology of continents. Richard Owen.
The Minnesota valley in the Ice age. Warren Upham.
On the ancient Glaciation of North America; its extent, character and teachings. J. S Newberry.
Result of explorations of the Glacial boundary between New Jersey and Illinois. G. F. Wright.
On the Terminal Moraine west of Ohio. T. C. Chamberlin.
Relation of the Glacial dam at Cincinnati to the terrace in the Upper Ohio and its tributaries. I. C. White.
Changes in the currents of the ice of the last Glacial epoch in Eastern Minnesota. Warren Upham.
The Kame rivers of Maine. G. H. Stone.
Evidences from Southern New England against the Iceberg theory of the Drift. J. D. Dana.
Animal remains from the Loess and Glacial clays. Wm. McAdams.
On the eroding power of Ice. J. S. Newberry.
On the Hamilton sandstone of Middle Pennsylvania. E. W. Claypole.
The Pre-cambrian rocks of the Alps. T. Sterry Hunt.
The "Earthquake" at New Madrid, Mo., in 1811, probably not an earthquake. James Macfarlane.
On the Serpentine of Staten island, New York. T. Sterry Hunt.
On the genesis and classification of mineral veins. J. S. Newberry.
On a large Crustacean from the Catskill group of Pennsylvania. E. W. Claypole.

Section F.

Psephenus lecontei; on the external anatomy of the larva. D. S. Kellicott.
Parallelism of structure of Maize and Sorghum kernels. E. L. Sturtevant.
Relation of leaf and root areas: Corn. D. P. Penhallow.
Note on the present condition of the box huckleberry, *Vaccinium brachycerum*, in Perry county, Pennsylvania. E. W. Claypole.
Influence of position on seed. E. L. Sturtevant.
Agricultural botany. E. Lewis Sturtevant.
Conscious automatism. C. P. Hart.
Mya arenaria; its changes in Pliocene and prehistoric times. E. S. Morse.
On the structure of the skull in *Diclonius mirabilis*, a Laramie Dinosaurian. E. D. Cope.
On the Trituberculate type of superior molar, and the origin of the Quadritubercu-late. E. D. Cope.
Pharyngeal respiration in the soft-shelled turtle, *Aspidonectes spinifer*. S. H. Gage.
An abnormal Orchid; *Habernaria hyperborea*. W. R. Dudley.
Origin of the Flora of the Central New York lake region. W. R. Dudley.
Periodicity of *Sabbacia angularis*. Miss M. E. Murtfeldt.
On a new plan of Museum case. E. S. Morse.
The application of Nitrous Oxide and Air to produce Anæsthesia, with clinics on animals in an experimental air chamber. E. P. Howland.
Development of a dandelion flower. J. M. Coulter.
Leaves of the Gramineæ with closed sheaths. W. J. Beal.
A supposed poisonous seaweed in the lakes of Minnesota. J. C. Arthur.
The position of the Compositæ in the natural system. Joseph F. James.
On the use of vaseline to prevent the loss of alcohol from specimen jars. B. G. Wilder and S. H. Gage.
On two primitive types of Ungulata. E. D. Cope.

Note on Phytoptidæ. Herbert Osborn.
Note on the potato beetle and Hessian fly for 1883. E. W. Claypole.
Oyster farming in Connecticut. H. C. Hovey.
The Psyllidæ of the United States. C. V. Riley.
Some recent discoveries in reference to Phylloxera. C. V. Riley.
Observations on Cephalopoda. A. Hyatt.

SECTION H.

Indoor games of the Japanese. E. S. Morse.
The great mounds of Cahokia. Wm. McAdams.
Life among the Mohawks in the Catholic missions of Quebec province. Mrs. Erminnie A. Smith.
Metrical standard of the Mound-builders—by the method of even divisors. Chas. Whittlesey.
The Mound-builders identified. John Campbell.
An abnormal human skull from a stone grave in Tennessee. F. W. Putnam.
Typical shapes among the Emblematic mounds. The different attitudes exhibited by the same animal. S. D. Peet.
Personal observations of the Missouri river mounds from Omaha to St. Louis; considered from a geological standpoint. Their invariable association with the Loess and Terrace formation. E. P. West.
Osage war customs. J. O. Dorsey.
Symbolic earth formation. Mrs. A. C. Fletcher.
Some observations on the laws and privileges of the Gens in Indian society. Mrs. A. C. Fletcher.
An ancient village of the emblematic Mound-builders. Caches guarded by effigies. Effigies guarding the village, and sacrificial places not far away. S. D. Peet.
The Charnay collection at Washington. O. T. Mason.
A new stand for mounting skulls, by E. E. Chick. F. W. Putnam.
Accidents or mode signs of verbs in the Iroquois dialects. Mrs. Erminnie A. Smith.
The correspondence between the prehistoric map of North America and the system of social development. S. D. Peet.
Kitchens of the East. E. S. Morse.
Methods of arrow release. E. S. Morse.
Game drives among the Emblematic mounds. S. D. Peet.
Studies in the Iroquois concerning the verb *to be* and its substitutes. Mrs. Erminnie A. Smith.
High places connected with ancient villages; the religious structures common to villages in prehistoric time. S. D. Peet.
Vestiges of glacial man in Central Minnesota. Miss F. E. Babbitt.
A classification of the Sciences. J. W. Powell.

SECTION I.

The German carp and its introduction into the United States. C. W. Smiley.
Cable cars for city passenger traffic. E. T. Cox.
Building Associations. Edgar Frisby.
Health Foods. Stephen S. Haight.
Improved method of spraying fruit and shade trees for protection against leaf-eating insects. C. V. Riley.
Enhancement of values in agriculture by reason of non-agricultural population. J. R. Dodge.
A new system for the treatment of sewer gas. T. E. Jefferson.
Life insurance and self-insurance. Elizur Wright.
The increase of the colored population of the United States. C. S. Mixter.
The German carp and its introduction into the United States. C. W. Smiley.
Sotol, a Texan forage plant. Clifford Richardson.